C04B

LIME, MAGNESIA; SLAG; CEMENTS; COMPOSITIONS THEREOF, e.g. MORTARS, CONCRETE OR LIKE BUILDING MATERIALS; ARTIFICIAL STONE {(roofing granules E04D 7/005)}; CERAMICS (devitrified glass-ceramics C03C 10/00); REFRACTORIES; TREATMENT OF NATURAL STONE

Definition statement

This place covers:

Chemical aspects of the processing of lime, magnesia or dolomite and of molten slag.

Compositional aspects of:

- inorganic binders, such as hydraulic cements ;
- mortars, concrete and artificial stone, e.g. the choice of fillers or active ingredients therefore;
- shaped ceramic products, e.g. clay-wares, refractories , non-oxides.

Physico-chemical aspects of methods for obtaining mortars, concrete, artificial stones or ceramics , e.g. for delaying the setting time of mortar compositions.

Treatment including defibrillating of materials such as fillers , agglomerated or waste materials, or refuse to enhance their filling properties in mortars, concrete or artificial stone.

Porous mortars, concrete, artificial stone or ceramic ware, and the preparation thereof.

Methods and apparatus for:

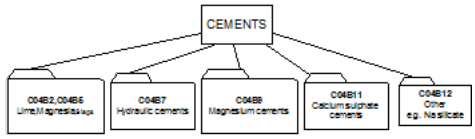
- burning or slaking lime;
- obtaining mineral binders, e.g. Portland cement or hemihydrate plaster;
- the expansion of mineral fillers , such as clay, perlite or vermiculite.

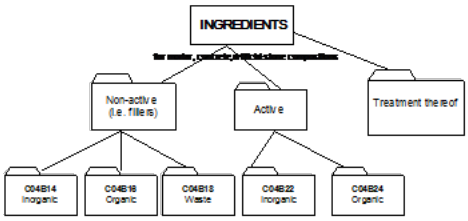
After- treatment of artificial stones, mortars, concrete and ceramics , e.g. coating or impregnation of green concrete after primary shaping.

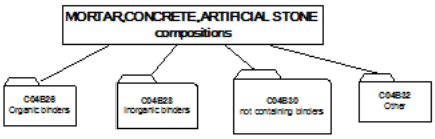
Non-mechanical treatment of natural stone.

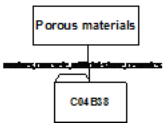
Processing powders of inorganic compounds in preparation to the manufacturing of ceramic products .

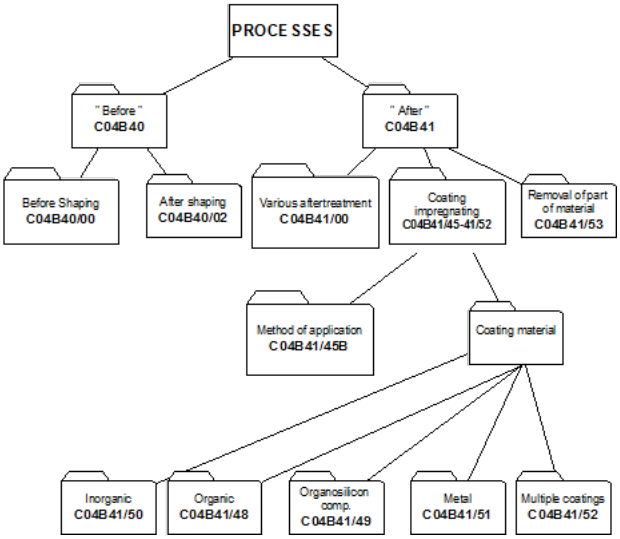
The joining of burned ceramics with other articles by heating.











References

Limiting references

This place does not cover:

Granulating apparatus	B01J 2/00
Mechanical features relating to the working of mortars, concrete, stone, clay-wares or ceramics , e.g. mixing or shaping ceramic compositions, boring natural stone	B28
Chemical preparation of powders of inorganic compounds	C01
Devitrified glass-ceramics	C03C 10/00
Compositions containing free metal bonded to carbides, diamond, oxides, borides, nitrides, silicides, e.g. cermets, or other metal compounds, such as oxynitrides or sulfides, other than as macroscopic reinforcing agents	C22C

Building elements or constructions; Finishing work on buildings	E04

Informative references

Attention is drawn to the following places, which may be of interest for search:

Materials for prostheses or for coating prostheses	A61L 27/00
Chemical or biological purification of waste gases	B01D 53/34
Layered products	B32B
Treating inorganic non-fibrous materials to enhance their pigmenting or filling properties	C09C
Adhesives	C09J
Cementing or plastering compositions for boreholes or wells	C09K 8/00
Alloys based on refractory metals	C22C
Shaft or vertical furnaces in general	F27B 1/00
Hydraulic hardening materials , e.g. concretes, ceramics or refractories for protection against radiation, i.e. shielding	G21F 1/00

Special rules of classification

In this subclass, for the parts C04B 2/00-C04B 32/00, C04B 38/00, C04B 40/00, C04B 41/00 the CIS indexing system is used. For details, see below

Combination set (C-sets)

1. Introduction

1.1 This manual relates to the rules to be applied when classifying documents using C-sets in the "cement part" of subclass C04B. With the "cement part" we mean the whole of the subclass, with the exception of the range C04B 33/00 - C04B 37/00.

However, symbols of the range C04B 33/00 - C04B 35/00 can be used as Indexing Codes (when the classification is in C04B 38/00 or C04B 41/00).

1.2 C-sets are used in three major areas:

- C04B 2/00 - C04B 32/00 and C04B 40/00: Compositions of cement/concrete mixtures or of artificial stone like materials

- C04B 38/00: porous materials

- C04B 41/00: after treatment.

1.3 Symbols that are used in the present C-set system are chosen from:

- C04B 2/00 - C04B 41/00 (with the exception of C04B 37/00):

these are symbols which can be used as classification as well as symbols in the combination sets (C-set),

C04B 2103/00 - C04B 2201/00, C04B 2290/00:

these are symbols used as additional information (CCA) or within the C-set (see below).

1.4 The principles of Combination sets are based on the possibilities offered by the IPC (until IPC7) for using classification symbols also as (linked) Indexing Codes.

The C-sets are present in EPODOC:

/CCI : CPC classification symbol

/CCA: Additional information

/CLC: the combination sets (C-sets) of symbols linked to the classification (CCI) or to the additional information (CCA)

The first symbol of a C-set is referred to as the "base class". Symbols in the C-set are separated by a comma (,).

The base group can be an CCI or CCA group

2. C-sets in the range C04B 2/00 - C04B 32/00 and C04B 40/00

2.1 This part of C04B relates to cement-, mortar-, concrete- and artificial stone compositions or their constituents or ingredients.

As a general rule such compositions (further referred to as "mixtures") contain three types of ingredients:

- one or more binders (organic or inorganic)

- fillers (inactive ingredients)

- active ingredients, e.g. accelerators.

[Exception: main group C04B 30/00 relates to compositions not containing binders].

2.2 Overview of main groups:

- C04B 2/00 - C04B 12/00 : relate to inorganic binders as such

- C04B 14/00 - C04B 20/00 : relate to fillers

- C04B 22/00 - C04B 24/00 : relate to active ingredients

- C04B 26/00 - C04B 32/00 : relate to the mixtures

- C04B 40/00 : relates to characteristics / preparation of the mixtures

2.3 Classification rules:

2.3.1 When an invention relates to an individual ingredient, classification is made in the range C04B 2/00 - C04B 12/00 if this ingredient is a binder, in the range C04B 14/00 - C04B 20/00 if the ingredient is a filler and in the range C04B 22/00 - C04B 24/00 if it is an active ingredient.

2.3.2 When an invention relates to a mixture, classification is made in the range C04B 26/00 - C04B 32/00, according to the binder used while applying the last place rule (LPR). So if a combination of an organic and an inorganic binder is present, classification is made in C04B 28/00, not in C04B 26/00. If a combination of two inorganic binders is present, classification is done in C04B 28/00 according to the LPR for one of the binders, the others are added as symbols in the C-set and are chosen from C04B 7/00-C04B 12/00 groups. If one of the ingredients is (suspected to be) new or unusual, or special details describing this ingredient are given, classification is also made for this ingredient.

2.3.3 When the invention merely relates to the preparation or characteristics of the mixture, classification is made in C04B 40/00. If the mixture as such or one of its ingredients is considered to be new or unusual, classification is made for these aspects too. For obtaining porous materials see point 3. below.

2.3.4 When the invention relates to an active additive which is a mixture on its own, e.g. the combination of two specific polymers and a specific inorganic salt, classification is made in C04B 40/0039. If the use of one of the ingredients as such is new to the field, classification for this ingredient as such is made also.

2.4 C-set rules:

2.4.1 Primary goal of the combination set is to identify the individual constituents of the mixtures, using the classification symbols for these ingredients as part of a C-set, linked to the classification symbol which already identifies (one of) the binder(s).

Example 1:

A mixture containing a mixed binder of aluminium cement, Portland cement and a polymeric co-binder, next to diatomaceous earth and an inorganic sulfate will be classified - according to the LPR - in C04B 28/06, the other ingredients being identified by the appropriate symbols in the C-set:

CCI: C04B 28/06 C-set (CLC) : C04B 28/06,C04B 7/02, C04B 14/08, C04B 22/142, C04B 24/26

An organic co-binder next to an inorganic binder is indexed as an active organic ingredient (main group C04B 24/00).

Because in this example, all ingredients as such are known in the field, no further classification is made.

2.4.2 When for one of the ingredients alternatives are mentioned, separate C-sets are made.

Example 2:

If in the example 1, an inorganic chloride was mentioned as an alternative to the sulfate, the indexing would look like:

Set 1: C04B 28/06, C04B 7/02, C04B 14/08, C04B 22/142, C04B 24/26

Set 2: C04B 28/06, C04B 7/02, C04B 14/08, C04B 22/12, C04B 24/26

(Putting C04B 22/12 and C04B 22/142 in the same set would mean they are both present in the same mixture).

2.4.3 When classification is made for individual (active) ingredients, their function or in some cases their characteristics can be identified using the C04B 2103/00 series.

Example 3:

A new organic sulfonated plasticizer:

/CCI : C04B 24/16 /CCA : C04B 2103/30

When for a mixture, many alternatives for the same ingredient with a specific function are mentioned, instead of making a set for each alternative, only one C-set with the C04B symbol in the C-set for the function can be made. If one of the alternatives is preferred in the document a second set with the symbol for that alternative can be made too.

Example 4:

In a concrete mixture, a superplasticizer is added. This superplasticizer can be chosen from many alternatives, for each of which a C04B 24/00 entry exist. However a lignosulfonate is preferred.

/CCI : C04B 28/02 C-set 1 C04B 28/02, C04B 2103/32

C-set 2 C04B 28/02, C04B 24/18

2.4.4 In a similar way, characteristics or uses of the mixtures are identified with symbols of the C04B 2111/00 series. These symbols are always used as additional information.(CCA)

Example 5:

The composition of example 1 is used for sound insulation:

In addition to the above sets CCA: C04B 2111/52

2.4.5 When information is given about the preparation or characteristics of

the mixtures - this information not being the “main” information - additional symbols of main group C04B 40/00 can be added in the C-set.

Example 6:

The mixture of example 1 is hardened using microwaves:

C-set : C04B 28/06, C04B 7/02, C04B 14/08, C04B 22/142, C04B 24/26, C04B 40/0218

The mixture of example 1 is of the deferred action type:

C-set: C04B 28/06, C04B 7/02, C04B 14/08, C04B 22/142, C04B 24/26, C04B 40/06

2.4.6 When the process of making is the main invention a CCI in C04B 40/00 can be given. As a general rule, when classifying in C04B 40/00, symbols in the C-set are used to identify the kind of mixture, not to identify the individual ingredients. If it is important to identify these ingredients, further classification is made as mixture and the ingredients are identified by symbols linked to the classification symbol of the mixture in the C-set.

Example 7:

If only common ingredients are used:

/CCI : C04B 40/0286 C-set: C04B 40/0286, C04B 28/06

If also the composition of the mixture is of interest:

/CCI C04B 40/0286 and C04B 28/06

C-set 1: C04B 40/0286, C04B 28/06

C-set 2: C04B 28/06, C04B 14/386, C04B 22/0013

2.4.7 A special case within main group C04B 40/00 are the pre-mixtures of ingredients.

Here the same principle as for point 2.4.1 is applied, i.e. the classification symbols identifying the ingredients are linked to C04B 40/0039 (CCI) and a symbol from the range C04B 26/00 - C04B 32/00 is added to the C-set to indicate for which kind of mixture the pre-mixture is intended to be used.

Example 8:

/CCI :C04B 40/0042 C-set : C04B 40/0042,C04B 14/08,C04B 22/142,C04B 24/26, C04B 28/06

2.4.8 In the range for inorganic binders as such (C04B 2/00 - C04B 12/00) symbols can also be used in a C-set to identify aspects for which a classification symbol exists, but which aspects as such are not important enough to be classified.

Example 9:

/CCI: C04B 7/47 C-set : C04B 7/47, C04B 7/364

Example 10:

/CCI : C04B 11/26 C-set : C04B 11/26, C04B 11/024

2.4.9 For agglomerated materials (= artificial aggregates or fillers), which are classified in C04B 18/021 and subgroups, the starting materials other than the binder can be identified with further symbols in the C-set.

Example 11:

Making artificial gravel from a mixture of cement and mining refuse:

/CCI : C04B 18/021 C-set : C04B 18/021, C04B 18/12

2.4.10 Main group C04B 20/00 is a general group for fillers. When classification is made in this group, very often the specific filler involved is identified by adding the specific filler symbol in the C-set..

Example 12:

Expanding perlite in a rotary kiln:

/CCI: C04B 20/061 C-set: C04B 20/061, C04B 14/18

Example 13:

Coating alumina with metal:

/CCI : C04B 20/1062 C-set : C04B 20/1062, C04B 14/303

2.4.10a Groups C04B 20/123 and C04B 20/126 are used in the C-set only in combination with C04B 20/12 to indicate:

-in the case of C04B 20/123 that a coating is an alternative to the previous indicated coating

Example 14:

C04B 20/12, C04B 18/22, C04B 20/1037

C04B 20/12, C04B 18/22, C04B 20/1033, C04B 20/123

C04B 20/12, C04B 18/22, C04B 20/1055

-in the case of C04B 20/126 that the coating layer is the same as a previous coating layer

Example 15:

C04B 20/12, C04B 18/22, C04B 20/1037

C04B 20/12, C04B 18/22, C04B 20/1033

C04B 20/12, C04B 18/22, C04B 20/1037, C04B 20/126

3.Classifying in main group C04B 38/00.

3.1 This part of C04B relates to porous or lightweight cement-, mortar-, concrete-and artificial stone compositions and porous or lightweight ceramics.

More generally we could say that C04B 38/00 relates to inorganic foamed materials or bodies, with the exception of foamed metal.

Subdivision of C04B 38/00 is largely based on the methods used for obtaining the porosity or the reduction in weight, e.g. by adding lightweight filler (C04B 38/08), by adding a gas forming agent (C04B 38/02) or by burning out a burnable additive (C04B 38/06).

3.2 Classification and C-set rules:

3.2.1 Officially in main group C04B 38/00, there is no LPR. Nonetheless when porosity is obtained by a combination of methods, as a general rule, classification is made in the last appropriate place. The second method, not identified by classification (CCI), is identified by a C04B 38/00 symbol in the C-set. If of interest, documents can be even classified twice (see further point 3.2.3)

3.2.2 The central idea for classification/indexing in C04B 38/00 is:

- classification according to the method (see 3.2.1) and

- Indicating the nature of the material that is made porous or lightweight.

For identifying the nature of the material, symbols can be chosen from C04B 26/00 - C04B 35/00. In very exceptional cases also C04B 14/00 symbols can be used.

Example 16:

Obtaining a porous silicon carbide body by dissolving out a soluble salt.

/CCI : C04B 38/04 C-set: C04B 38/04, C04B 35/565

Example 17:

Obtaining porous porcelain by burning out a monolithic PUR sponge impregnated with clay slip:

/CCI : C04B 38/0615 C-set : C04B 38/0615, C04B 33/24

HOWEVER there is a fundamental difference in approach when classifying "cement type" mixtures and “ceramic type” materials or bodies: see points 3.2.6 and 3.2.7 below!

3.2.3 When a combination of methods is used, the method that is not identified by the classification is given a C04B 38/00 symbol in the C-set.

Example 18:

To the material of example 14 there is also added a gas forming agent:

/CCI : C04B 38/04 C-set: C04B 38/04, C04B 35/565, C04B 38/02

3.2.4 In the same way other aspects of interest can be identified by giving further C04B 38/00 symbols.

Example 19:

The material of example 18 is characterised by the dimensions of the nano-sized pores and the overall % of porosity:

/CCI : C04B 38/04 C-set: C04B 38/04,C04B 35/565,C04B 38/0054,C04B 38/0074, C04B 38/02

3.2.5 When classifying in main group C04B 38/00, in the same way as for the indexing of mixtures as described in point 2 above, symbols of the series C04B 2111/00 can be used to indicate properties are uses, e.g. sound insulation.

Example 20:

The material of example 17 is used for electronic applications:

/CCI: C04B 38/0615 CCA : C04B 2111/00844 C-set: C04B 38/0615, C04B 33/24

3.2.6 Porous or lightweight ceramics are always classified in C04B 38/00 according to rules 3.2.1 to 3.2.5

3.2.7 Porous or lightweight cement-, concrete-, artificial stone- and like mixtures:

3.2.7a These type of mixtures are classified as such mixtures, so in the range C04B 26/00 - C04B 32/00, according to the rules of point 2 above. The appropriate C04B 38/00 symbols are added in the C-set.

Example 21:

Reinforced portland cement based concrete containing also carbon fibres and made porous by adding Al particles (Al will react with $Ca(OH)_2$ liberated during cement hardening and thus produce H_2 gas):

/CCI : C04B 28/04 C-set: C04B 28/04, C04B 14/386, C04B 22/04, C04B 32/02, C04B 38/02

Example 22:

Foaming gypsum by adding specific sulfonated foaming agent:

/CCI: C04B 28/14 C-set: C04B 28/14, C04B 24/16, C04B 38/10

3.2.7b When one or more of the other symbols give sufficient "C04B 38/00 information", no further C04B 38/00 symbols are given.

Example 23:

Expanded clay containing concrete will NOT receive symbol C04B 38/08, because C04B 14/12 already gives sufficient information:

/CCI: C04B 28/02 C-set: C04B 28/02, C04B 14/12

3.2.7c So as a general rule these kind of mixtures are not classified in main group C04B 38/00. Classification is made in this main group only when the invention relates to the process of obtaining the porosity or the reduction of weight. When the composition as such is still interesting in such a case, further classification is made for the mixture.

Example 24:

The characteristic feature of the invention of example 21 is the way in which the Al particles are handled in the context of obtaining the gas concrete:

/CCI : C04B 28/04 and C04B 38/02

C-set 1: C04B 28/04, C04B 14/386, C04B 22/04, C04B 32/02, C04B 38/02

C-set 2: C04B 38/02, C04B 28/04

3.2.8 While in general the LPR is applied in main group C04B 38/00, exception is made for obtaining porous or lightweight ceramic particles C04B 38/009. As a general rule, this group takes precedence over the other C04B 38/00 groups.

Example 25:

Obtaining porous alumina particles by burning out polymeric core:

/CCI C04B 38/009 C-set: C04B 38/009, C04B 35/10, C04B 38/0615

4. Classifying in main group C04B 41/00

4.1 This part of C04B relates to the after-treatment of materials covered by C04B,

i.e. after-treatment of cement-, mortar-, concrete- and artificial stone products as well as ceramic materials AND natural stone. Hereinafter the treated materials are referred to as "substrates".

While other kinds of after-treatment are not excluded, C04B 41/00 relates to after-treatment of substrate, mainly to :

- coating or impregnation of the substrates: C04B 41/45 and subgroups

- removing material from the substrates: C04B 41/53 and subgroups.

In main group C04B 41/00, no distinction is made between coating or impregnation. Therefore the terms coating, impregnation and layer are considered equivalent.

4.2 Classification and C-set rules:

4.2.1 As a general rule subdivision of main group C04B 41/00 is based on aspects relating to the method of after-treatment, such as the selection of the method for applying the coating material on the substrate, e.g. by CVD (C04B 41/4531) or the selection of the coating or impregnation material with which the substrate is treated, e.g. coating with carbon (C04B 41/5001).

When using C-set, only the range C04B 41/00 - C04B 41/5392 is used . Documents classified in the range C04B 41/60 - C04B 41/91 always get also a class in C04B 41/00 - C04B 41/5392, which may be combined with one or more C-sets.

4.2.2 To identify the substrate that is after-treated, the class C04B 41/009 is given and C-sets are created using complementary symbols chosen from:

- C04B 14/02 - C04B 14/36 when natural stone is treated

- C04B 26/00 - C04B 32/005 when artificial stone, e.g. concrete is treated

- C04B 33/00 - C04B 35/83 when ceramics are treated

- C04B 38/00 - C04B 38/106 when porous materials are treated

- C04B 14/38 - C04B 14/48 when ceramic fibres are treated, i.e. only when classifying in C04B 41/4584.

When the substrate is further defined e.g. a wood fiber/particle board, which in itself is information that does not require classification in the substrate class itself e.g. C04B 28/02 , then the C04B 41/009 set will be:

C04B 41/009,C04B 18/26,C04B 28/02

If a class in C04B 28/00 is also required because the mixture per se is interesting and is part of the invention information, then the C04B 41/009 set will comprise only the C04B 28/02 symbol

Example 26:

Impregnating a natural marble stone with polyester:

/CCI: C04B 41/4826 and C04B 41/009 C-set : C04B 41/009, C04B 14/285

Example 27:

Concrete based on aluminium cement is treated with waterglass (Na-silicate):

/CCI: C04B 41/5089 and C04B 41/009 C-set : C04B 41/009,C04B 28/06

Example 28:

A silicon nitride body is glazed:

/CCI: C04B 41/5022 and C04B 41/009 C-set :C04B 41/009, C04B 35/584

Example 29:

Coating alumina fibres with aluminium:

/CCI: C04B 41/4584 and C04B 41/009

C-set 1:C04B 41/009, C04B 14/4625

C-set 2: C04B 41/4584, C04B 41/5155

So for classification, C04B 41/4584 takes precedence over other C04B 41/00 groups when ceramic particles or fibres are treated!

Multiple coating of particulate or fibrous material is usually also classified in C04B 41/52 so that it is possible to attribute C-sets for each coating layer (see point 4.2.5 below).

4.2.3 In main group C04B 41/00, the LPR applies. As most subgroups relate to specific methods of applying coatings are subgroups of C04B 41/4505, while the groups identifying the nature of the coating material are further down in the scheme, this LPR in general results in a classification according to the material applied. One or more symbols identifying aspects of the method used are added in the C-set.

Example 30:

The process of example 26 is carried out under vacuum and increased temperature:

/CCI: C04B 41/4826 and C04B 41/009

C-set 1: C04B 41/009, C04B 14/285

C-set 2: C04B 41/4826, C04B 41/0072, C04B 41/4515

However, when the invention relates to the process proper, classification is made in the process group and a further symbol is used in the C-set for identifying the applied material on the substrate. If more ample information has to be given about the nature of the coating, classification is also made for this aspect in combination with a further C-set.

Example 31:

The process of example 26 is carried out under an atmosphere of very specific composition, this composition being the essential feature of the invention:

/CCI: C04B 41/4519 and C04B 41/009

C-set 1:C04B 41/009, C04B 14/285

C-set 2: C04B 41/4519, C04B 41/4826

Example 32:

In the example 31, the polyester can be mixed with other polymers:

/CCI: C04B 41/4519 and C04B 41/4826 and C04B 41/009

C-set 1: C04B 41/009, C04B 14/285

C-set 2: C04B 41/4519, C04B 41/4826

C-set 3:C04B 41/4826, C04B 41/4519, C04B 41/4811, C04B 41/4823

Exception on the LPR: for classification, C04B 41/4584 takes precedence over other groups of C04B 41/00 when treatment of ceramic fibres or particles is concerned (see example 29).

4.2.4 When alternatives are to be identified, the same procedure is applied as for concrete and like mixtures, i.e. two or more C-sets of symbols are made. There might be alternatives both for the process and the material applied to the substrate.

Example 33:

The treatment of example 27 can be carried out either under vacuum or under inert atmosphere:

/CCI: C04B 41/4826 and C04B 41/009

C-set 1: C04B 41/009, C04B 14/285

C-set 2: C04B 41/4826, C04B 41/4515

C-set 3: C04B 41/4826, C04B 41/4517

4.2.5 Multiple coating or impregnation.

When the same substrate is coated with two or more layers, classification is made in C04B 41/52. If one of the layers as such might be new in the field, classification for this layer as such is made too.

For each layer a separate C-set is made, each starting with C04B 41/52, the first set relating to the first layer, the second set relating to the second layer etc.

Example 34:

A clay ware body is first coated with an engobe and then with a glaze:

/CCI: C04B 41/52 and C04B 41/009

C-set 1: C04B 41/009, C04B 33/00

C-set 2: C04B 41/52, C04B 41/504

C-set 3: C04B 41/52, C04B 41/5022

Example 35:

The engobe used in example 34 looks new to the field:

/CCI: C04B 41/52 and C04B 41/009 and C04B 41/504

C-set 1: C04B 41/009, C04B 33/00

C-set 2: C04B 41/52, C04B 41/504

C-set 3: C04B 41/52, C04B 41/5022

Exception: when the different coatings result in layers of the same composition, classification is made according to the nature of that layer and C04B 41/52 is added to the C-set !

Example 36:

A boron carbide body is coated with two or more layers, which might slightly differ in composition, but which all result in a carbon coating:

/CCI: C04B 41/5001 and C04B 41/009

C-set 1: C04B 41/009, C04B 35/563

C-set 2: C04B 41/5001, C04B 41/52

As for single layer coatings, additional C04B 41/00 codes can be added to the C-set to identify other interesting aspects of the respective coatings.

4.2.6 When, in the case of multiple coating, alternatives are mentioned, the following procedure is followed.

If, e.g. for layer 2 an alternative is to be identified, the third C-set will represent this alternative layer, with at the end the symbol C04B 41/522. [This symbol is not to be used for classification.] So in this case, a possible third layer will be identified by the fourth C-set, because the third one refers to an alternative of the second layer (represented by the second set).

Example 37:

In the example 34, a porcelain layer can be used as an alternative to the engobe layer:

/CCI: C04B 41/52 and C04B 41/009

C-set 1: C04B 41/009, C04B 33/00

C-set 2: C04B 41/52, C04B 41/504

C-set 3: C04B 41/52, C04B 41/5038, C04B 41/522

C-set 4: C04B 41/52, C04B 41/5022

-When a coating layer is the same as a previous coating layer, a similar procedure as above is followed, adding the symbol C04B 41/524 at the end of the layer that is identical to a previously identified layer

Example 38

C - C04B 41/52, C04B 41/4529, C04B 41/5045

- C04B 41/52, C04B 41/4529, C04B 41/5054

- C04B 41/52, C04B 41/4529, C04B 41/5045, C04B 41/524

- C04B 41/52, C04B 41/4529, C04B 41/5055

- C04B 41/52, C04B 41/4529, C04B 41/5045, C04B 41/524, C04B 41/524%2

- C04B 41/5055, C04B 41/4529, C04B 41/5031

4.2.7 For the sake of classification/C-sets in C04B, treatment of "green" concrete or ceramics, i.e. concrete that has not hardened yet, resp. ceramic products that are not fired yet, is considered to be covered by C04B 41/00. Such documents will receive C04B 41/4578 as an extra symbol in the C-set. Only in exceptional cases, classification can be made in this group.

Example 39:

The substrate of example 25 is treated before hardening of the concrete:

/CCI: C04B 41/5089 /SI : C04B 28/06 C-set: C04B 41/5089, C04B 41/5007

4.2.8 Group C04B 41/53 relates to the removal of part of the materials of the treated article. A coating process including a step like polishing, roughening or etching is however not classified in C04B 41/53 or a subgroup (what could be expected applying the last place rule), but is classified applying the

general rules for coatings above and adding C04B 41/53 or a subgroup to the C-set. If however the removal is the essential step of the invention, classification in C04B 41/53 is (also) made.

4.2.9 In the same way as when classifying/C-sets in the other parts of C04B, mentioned above, symbols of the series C04B 2111/00 can be used to identify uses or characteristics of the products obtained.

Example 40:

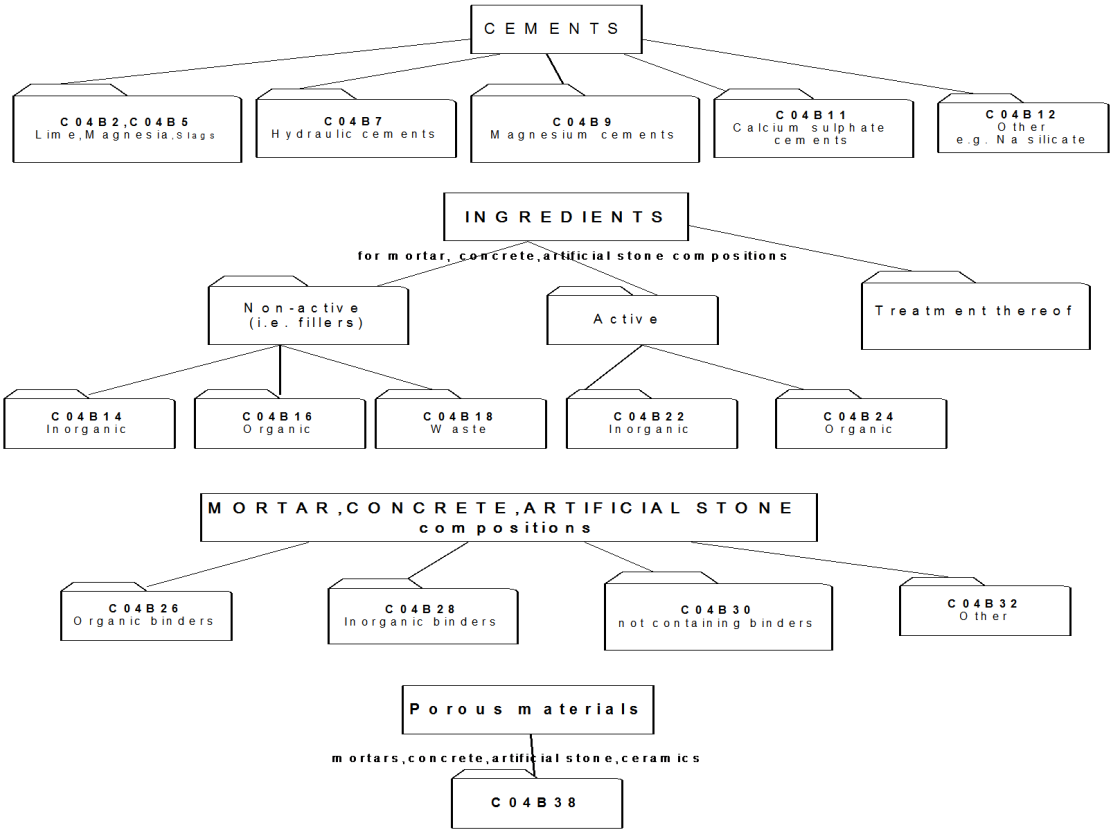
The material of example 36 is used for electronic applications:

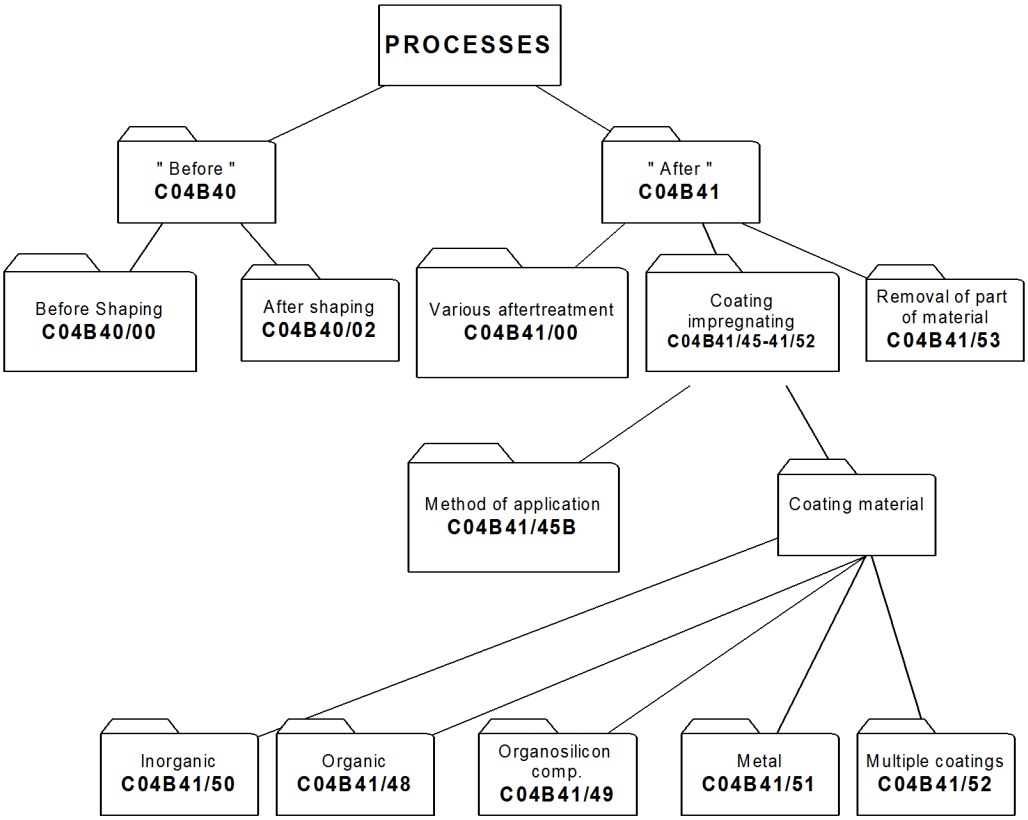
/CCI: C04B 41/5001 , C04B 41/009

/Indexing Code: C04B 2111/00844

C-set 1: C04B 41/009,C04B 35/563 and

C-set 2: C04B 41/5001, C04B 41/52





Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Active ingredients	Ingredients having an effect on the mortar-, concrete- or artificial stone composition during processing or on the characteristics of the final product, e.g. as set accelerator, as dispersant or as gas generating agent. Other examples are processing aids or property improvers, e.g. grinding aids, used after the cement burning process or in the absence of such a burning process.
Cement	The binder proper, i.e. excluding any additional ingredient or additive added to the finished binder as such, with the exception of mixtures of binders.
Clinker	The unground sintered product leaving the cement kiln. In patent literature this term might be used literally, i.e. to indicate the unground sintered product leaving the cement kiln, or it might be used to indicate the ground cement without any additive, i.e. not interground with additives such as gypsum.
Ceramics	Inorganic, non metallic products obtained by a process involving a shaping step and a sintering or comparable heat treatment step, with the exclusion of cements , cermets and glasses, glazes, vitreous enamels and devitrified glass ceramics.
Fillers	Inactive ingredients, include pigments, aggregates and fibrous reinforcing materials.
Fine ceramics	Ceramics having a polycrystalline fine-grained microstructure, e.g. of dimensions below 100 micrometer.

Hydraulic binder	For the purpose of classification and search in this subclass, the terms " cement " and " hydraulic binder " are considered to be equivalent, even if in literature, an hydraulic binder might be defined as a mixture of cement and one or more inorganic additives.
Mortar- , concrete- and artificial stone compositions	They are considered as a single group of materials, are mixtures of one or more binders with fillers or other ingredients. In the context of such compositions, the terms " cement " and "binder" are considered equivalent.
Resin mortar or resin concrete	Mortar or concrete containing resin as a binder instead of cement , i.e. excluding any inorganic binder and containing a considerable amount of inorganic filler compared with the amount of the organic binder.
Refractories	Ceramics or mortars withstanding high temperatures of at least about 1500 degrees C. For classification and search in this subclass no substantial distinction is made between the terms " refractories " and " ceramics ".
Porous materials	Materials which are deliberately made porous, e.g. by adding gas-forming, foaming, burnable or lightweight additives to the composition they are made of.

C04B 2/00

Lime, magnesia or dolomite (hydraulic lime cements C04B 7/34)

Definition statement

This place covers:

Lime binders as such; Preparation thereof;

C-set is used only incidentally in this class. If so, symbols are chosen from other C04B 2/00 groups and C04B. A C04B 2/00 symbol in a C-set set having a C04B 28/00 CPC class indicates the presence of a second binder.

References

Limiting references

This place does not cover:

Hydraulic lime cements	C04B 7/34
Mixtures containing lime as a binder	C04B 28/10

C04B 2/02

Lime {(obtaining $Ca(OH)_2$ otherwise than by simple slaking of quick lime C01F 11/02)}

References

Limiting references

This place does not cover:

Obtaining Ca(OH)2 otherwise than by simple slaking of quick lime	C01F 11/02

C04B 2/04

Slaking {(simultaneous dehydrating of gypsum and slaking of lime C04B 11/022)}

Definition statement

This place covers:

Slaking, with water including air slaking, filtering after slaking

References

Limiting references

This place does not cover:

Devices for filtering after slaking	C04B 2/08
Simultaneous dehydrating of gypsum and slaking of lime	C04B 11/022
Warming up food and the like, e. g. by slaking lime	A47J 36/28, F24J 1/00
Hydration of MgO	C01F 5/16
Chemical heat sources	C09K 5/063

Informative references

Attention is drawn to the following places, which may be of interest for search:

Devices and method	documents are classified in C04B 2/08 and receive a C-set C04B 2/08; C04B 2/04

C04B 2/063

{Slaking of impure quick lime, e.g. contained in fly ash}

References

Limiting references

This place does not cover:

Hydrating cement clinker	C04B 7/51
Quenching coke	C10B 39/00

C04B 2/08

Devices therefor

Definition statement

This place covers:

Devices for slaking lime, e.g. devices for preparing milk of lime or for purifying slaked lime e.g. by filtering

C04B 2/12

in shaft or vertical furnaces (shaft or vertical furnaces in general F27B 1/00)

References

Limiting references

This place does not cover:

Shaft or vertical furnaces in general	F27B 1/00

C04B 5/00

Treatment of {metallurgical} slag (manufacture of slag wool C03B; in, or for, the production of metals C21B, C22B); Artificial stone from molten {metallurgical} slag (mechanical aspects B28B 1/54 {other cast stone C04B 32/005})

References

Limiting references

This place does not cover:

Mechanical aspects	B28B 1/54
Manufacture of slag wool	C03B
Other cast stone	C03B 32/005
Treatment of slag in, or for the production of metals	C21B, C22B

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Metallurgical slag	Slag from metallurgy processes

C04B 7/00

Hydraulic cements (calcium sulfate cements C04B 11/00)

Definition statement

This place covers:

Hydraulic cements as such and their manufacturing methods.

References

Limiting references

This place does not cover:

Porsal cement	C04B 7/32

Special rules of classification

CIS is used only incidentally in this class. If so, index codes are chosen from other C04B 7/00 groups and C04B. A C04B 7/00 index code in a CIS set having a C04B 28/00 EC class indicates the presence of a second binder.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Hydraulic cement	- like cements setting under the influence of water and - cements hardening in the air and under water

C04B 7/02

Portland cement

Definition statement

This place covers:

Portland cement (PC),

i.e. hydraulic cement produced by firing limestone or chalk and clay (or other silica, alumina, iron bearing materials) so that Ca-silicate sand aluminates are formed. Average composition: 45% C3S, 25%C2S, rest C3A, C4AF;

i.e. average oxide composition: SiO2 17-24, Al2O3 3-7, Fe2O3 1-5, CaO60-65, MgO 1-5, alkali 1, SO3 1-3;

i.e. average water : cement ratio is 0.4 - 0.6;

i.e. during hydration $Ca(OH)_2$ is formed, given thus an alkaline reaction;

i.e. PC clinker mostly coground with gypsum to retard setting;

e.g. WHITE PC: low proportion of iron oxide by the choice of raw materials or by firing in reducing flame;

e.g. MEDUSA CEMENT = white PC ;

e.g. LOW HEAT CEMENT : high % of C2S and C4AF, low % of C3S and C3A;

e.g. MASONRY CEMENT for more plastic mortar, often produced by grinding more finely than ordinary PC , a mixture of PC and limestone (or colloidal clay, diatomaceous earth);

e.g. RAPID HARDENING PC = ground finer than PC, slightly altered, setting time similar but strength developed more rapidly;

e.g. SULPHATE RESISTANT PC = high % of C3S and C2S, low % of C3A and C4AF. Should not contain C3A to avoid formation of ettringite (="cement bacillus")

C04B 7/04

using raw materials containing gypsum, {i.e. processes of the Mueller-Kuehne type}

Definition statement

This place covers:

Portland cement using raw materials containing gypsum, e.g. using $CaSO_4$ instead of chalk or limestone as raw material in the combined production of cement and H_2SO_4 (actually production of SO_2)

References

Limiting references

This place does not cover:

Ca-aluminosulfate cements	C04B 7/323

C04B 7/06

using alkaline raw materials (C04B 7/60 takes precedence)

Special rules of classification

C04B 7/60 takes precedence

C04B 7/12

Natural pozzuolanes; Natural pozzuolana cements; {Artificial pozzuolanes or artificial pozzuolana cements other than those obtained from waste or combustion residues, e.g. burned clay; Treating inorganic materials to improve their pozzuolanic characteristics} (cements containing slag C04B 7/14)

References

Limiting references

This place does not cover:

Slag cements	C04B 7/14
Cements based on fly ash	C04B 7/26
Cements based on combustion residues, e.g. from coal	C04B 7/28
Pozzuolans as fillers	C04B 14/14
Compositions based on (fly) ash, without addition of lime (producing) compound	C04B 28/021
Lime-pozzuolana based compositions	C04B 28/18

Informative references

Attention is drawn to the following places, which may be of interest for search:

Artificial pozzuolana cements	C04B 7/24 and subgroups

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Pozzuolana	a material that, ground and mixed with lime and water, produces at ordinary temperatures compounds with hydraulic properties;
Pozzuolana cement	obtained by grinding together a pozzuolana with cement clinker or (hydraulic) lime;

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- " Natural pozzuolanas "," Santorini earth "," Trass "," Volcanic ash "and " Diatomaceous earth "

C04B 7/14

Cements containing slag (slags from waste incineration C04B 7/28)

Definition statement

This place covers:

Hydraulic cements comprising slags as raw material, e.g. cements having low heat of hydration, cements with higher glass content (improved hydraulic characteristics)

References

Limiting references

This place does not cover:

Mâchefer (= slag from coal combustion)	C04B 7/28
Slags from combustion of coal, or waste incineration	C04B 7/28
Silicates added as active ingredients before/during the burning process	C04B 7/427

C04B 7/147

Metallurgical slag

Definition statement

This place covers:

Hydraulic cement containing metallurgical slag,

Examples of metallurgical slag :

blast furnace slag .;

STEELMAKING SLAGS.

L.D. slags, (as such not suited as hydraulic cement because of high content of CaO and MgO (lime and magnesia are sprayed on the bath during the oxygen injection for decarburizing and refining the steel)

References

Limiting references

This place does not cover:

Treatment of slag	C04B 5/06

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Scorie	metallurgical byproduct based on silicates

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

Laitier = scorie de haut fourneau = blast furnace slag

Laitier d'aciéries = steelmaking slags

LD slags = scorie d'aciéries

C04B 7/153

Mixtures thereof with other inorganic cementitious materials or other activators

Definition statement

This place covers:

Hydraulic cement containing metallurgical slag with other inorganic cementitious materials or other activators,

e.g. basic slags + PC clinker or anhydrite;

References

Limiting references

This place does not cover:

Ingredients added to the slag in the molten state	C04B 5/06

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

METAAL CEMENTEN = basic slags + PC clinker or anhydrite;

C04B 7/1535

{with alkali metal containing activators, e.g. sodium hydroxide or waterglass}

Special rules of classification

when the alkali activated slag results in a polymeric - Davidovits type - cement, additional classification in C04B 12/005 should be given

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

waterglass	Sodium silicate

C04B 7/17

with calcium oxide containing activators {(C04B 7/1535 takes precedence)}

Definition statement

This place covers:

Hydraulic cement containing metallurgical slag mixed with calcium oxide containing activators,

e.g. SLAG CEMENT = "cold process slag cement" = obtained by cogrinding granulated B.F. slag

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

BF slag = ciment de laitier

slakkencementen (BE) = ciment de laitier à la chaux (FR)

C04B 7/19

Portland cements

Definition statement

This place covers:

Hydraulic cement containing metallurgical slag mixed with Portland cements,

e.g. PORTLAND BLAST FURNACE CEMENT (GB) = cogrinding 65% B.F. slag +PC clinker (no gypsum);

e.g. PORTLAND BLAST FURNACE SLAG CEMENT (US) = 25-65% granulated B.F.slag;

e.g. CIMENTS DE HAUT-FOURNEAU (BE) = 30-70% granulated B.F. slag;

e.g. CIMENTS PERMETALLIQUES (BE) = more than 70% B.F. slag;

e.g. CIMENTS PORTLAND DE FER (FR) = 25-35% B.F. slag;

e.g. CIMENTS METALLURGIQUES MIXTES (FR) = 45-55% B.F. slag;

e.g. CIMENTS DE HAUT-FOURNEAU (FR) = 65-75% B.F. slag;

e.g. CIMENTS DE LAITIER AU CLINKER (FR) = more than 80% B.F. slag;

e.g. EISENPORTLANDZEMENT (DE) = less than (35 or) 40% B.F. slag;

e.g. HOCHOFENZEMENT (DE) = 36 (or 41) -85% B.F. slag;

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

Portland cements = ciments de haut-fourneau = ciment permétallique,= ciments Portland de fer = ciments métallurgiques mixtes = ciments de laitier au clinker = eisenportalndzement = hochofenzement

C04B 7/21

with calcium sulfate containing activators {(C04B 7/1535 takes precedence)}

Definition statement

This place covers:

Hydraulic cement containing metallurgical slagmixed with calcium sulfate containing activators,

e.g. SUPERSULPHATED CEMENT = granulated B.F. slag + CaSO4 + small % PC or lime

References

Limiting references

This place does not cover:

Cement containing metallurgical slag mixed with alkali metal containing activators	C04B 7/1535

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

Supersulphated cement = ciment métallurgique sursulfaté = ciment sursulfaté = sulfathüttenzement

C04B 7/24

Cements from oil shales, residues or waste other than slag

Definition statement

This place covers:

Hydraulic cement using as raw materials oil shales, residues or waste resulting from different processes, e.g. combustion waste, demolition waste, household, not being slag

References

Limiting references

This place does not cover:

Waste as additive to the raw material	C04B 7/42
Waste as fillers for concrete compositions	C04B 18/00

C04B 7/243

{Mixtures thereof with activators or composition-correcting additives, e.g. mixtures of fly ash and alkali activators}

Definition statement

This place covers:

Hydraulic cements produced from oil shales, residues or wastes mixed with activators or composition-correcting additives

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

when the alkali activated waste results in a polymeric - Davidovits type - cement, additional classification in C04B 12/005 should be given

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Activator	Material used to enhance the hydraulic activity of (waste) raw materials

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

Composition correcting additives = activators

C04B 7/26

from raw materials containing flue dust, {i.e. fly ash (C04B 7/243 takes precedence)}

References

Limiting references

This place does not cover:

Hydraulic cements from oil shales, residues or wastes other than slag mixed with activators or composition-correcting additives	C04B 7/243

C04B 7/28

from combustion residues, {e.g. ashes or slags from waste incineration} ({C04B 7/243} , C04B 7/26 take precedence)

Definition statement

This place covers:

Hydraulic cements produced from combustion residues,

e.g. artificial pozzuollans other than slags or fly ashes.

References

Limiting references

This place does not cover:

Hydraulic cements from oil shales, residues or waste other than slag mixed with activators or composition-correcting additives	C04B 7/243
Hydraulic cements from raw materials containing flue dust	C04B 7/26
Concrete compositions containing artificial pozzuollans	C04B 28/18

C04B 7/30

from oil shale; from oil shale residues; {from lignite processing, e.g. using certain lignite fractions}

Definition statement

This place covers:

Hydraulic cements produced from oils shale, from oil shale residues, from lignite processing,

e.g. simultaneous production of cement and combustion gas from coal

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

Schistes houillers = bitumineus kalksteen

C04B 7/32

Aluminous cements

Definition statement

This place covers:

Hydraulic aluminous cements, obtained by melting (or sintering) a mixture of bauxite and chalk; cooling; grinding.

Composed of :3CaO.Al2O3 (tricalcium dialuminate), CaO.2Al2O3 (calciumtetraaluminate), CaO.Al2O3 (calcium metaaluminate).

Comp.: CaO 37.7 ,Al2O3 38.5 , Fe2O3 12.7 , FeO 3.9 , SiO2 5.3 , SO3 0.1 .

Hydration: -->mostly 3CaO.Al2O.6H2O + Al(OH)3 formed;

i.e. characteristics: less aggressive to the skin than PC,

* very rapid strength development (24h = 28 days for PC)

*setting time = similar to PC

* sulphate/seewater resistant

* colour =black ,

* to be used to -10 C

used for castable refractories;

e.g. high alumina cement;

e.g. 11CaO.7Al2O3.CaX2

C04B 7/323

{Calcium aluminosulfate cements, e.g. cements hydrating into ettringite}

Definition statement

This place covers:

Hydraulic calcium aluminosulfate cements

e.g. 4CaO.3Al2O3.SO3;

C04B 7/34

Hydraulic lime cements; Roman cements; {natural cements}

Definition statement

This place covers:

i.e. HYDRAULIC LIME : obtained from limestone containing clay, burnt at 1000 - 1200 C ..>; beta-C2S, C2AS, C4AF .

WATERKALK. The more hydraulic the closer to cement;

i.e. ROMAN CEMENT = ROCK CEMENT = obtained by calcining a natural mixture of clay and limestone;

i.e. NATURAL CEMENT = idem (below sintering);

e.g. SELENITIC CEMENT = lime + 5 - 10% plaster of lime;

e.g. HYDRAULIC HYDRATED LIME = hydrated dry cement. Product obtained by calcining limestone containing silica and alumina to a temper. short of incipient fusion --->; sufficient free CaO formed to permit hydration and leaving unhydrated suffic. calc. silicate;

e.g. HIGH CALCIUM HYDRAULIC HYDRATED LIME = hydraulic hydrated lime containing <= 5% MgO;

e.g. HIGH MAGNESIUM HYDRAULIC HYDRATED LIME = hydraulic hydrated lime containing >= 5% MgO;

C04B 7/361

{Condition or time responsive control in hydraulic cement manufacturing processes (controlling or regulating in general G05; F27B 7/42 takes precedence)}

Definition statement

This place covers:

Controlling, monitoring hydraulic cement manufacturing processes,, e.g.. automation

References

Limiting references

This place does not cover:

Arrangement of controlling, monitoring rotary-drum furnaces	F27B 7/42
Controlling or regulating in general	G05

C04B 7/364

{Avoiding environmental pollution during cement-manufacturing}

Definition statement

This place covers:

Manufacture of hydraulic cements preventing environmental pollution during the process e.g. desulfuration

C04B 7/42

Active ingredients added before, or during, the burning process (after the burning process C04B 22/00, C04B 24/00)

Definition statement

This place covers:

Manufacture of hydraulic cements by treating raw materials with active ingredients added before or during the burning processes e.g. additives for obtaining white cement

References

Limiting references

This place does not cover:

Blended cements with slags	C04B 7/14
Adding ingredients after the burning process	C04B 22/00, C04B 24/00

C04B 7/425

{Acids or salts thereof}

Definition statement

This place covers:

Manufacture of hydraulic cements by treating raw materials with acids or salts added before or during the burning processes e.g. vanadates

C04B 7/43

Heat treatment, e.g. precalcining, burning, melting; Cooling {(aspects only relating to the installation F27B)}

References

Limiting references

This place does not cover:

Automatisation aspects	C04B 7/361
Desulfuration	C04B 7/364
Aspects only relating to the installation	F27B
Furnaces, kilns, ovens and details thereof	F27B, F27D

C04B 7/432

{Preheating without addition of fuel}

Definition statement

This place covers:

Manufacture of hydraulic cement by preheating without addition of fuel during the preheating step, for example by using exhaust gases, e.g. RSP = reinforced suspension preheater

C04B 7/434

{Preheating with addition of fuel, e.g. calcining}

Definition statement

This place covers:

Manufacture of hydraulic cement by preheating with addition of fuel , e.g. with addition of fuel in the calcining step, besides the addition of fuel in the kiln itself

C04B 7/4407

{Treatment or selection of the fuel therefor, e.g. use of hazardous waste as secondary fuel (fuels in general C10L); Use of particular energy sources, e.g. waste hot gases from other processes}

Definition statement

This place covers:

Treatment or selection of the fuel for the burning during the manufacture of hydraulic cement e.g. fuel for burning other raw material; waste hot gases

e.g. heavy fuel oil (S-content >1%)

References

Limiting references

This place does not cover:

Refuse consuming furnaces	F23G

C04B 7/4469

{in shaft or vertical kilns}

References

Limiting references

This place does not cover:

For lime	C04B 2/12
Shaft or vertical kilns in general	F27B 1/00

C04B 7/45

in fluidised beds, {e.g. spouted beds}

References

Limiting references

This place does not cover:

Calcination in fluidised beds	C04B 7/432, C04B 7/434

C04B 7/46

electric

Definition statement

This place covers:

Electric burning or melting during the manufacture of hydraulic cement

References

Limiting references

This place does not cover:

Non-electric melting	C04B 7/4484

C04B 7/48

Clinker treatment (C04B 7/47 takes precedence)

References

Limiting references

This place does not cover:

Cooling during the manufacture of the hydraulic cement	C04B 7/47

C04B 7/51

Hydrating

Definition statement

This place covers:

Clinker hydration during manufacture of hydraulic cement, i.e. in principle for the hydration of the lime content of the clinker;

e.g. hydrating ground clinker

C04B 7/52

Grinding; {After-treatment of ground cement}

Definition statement

This place covers:

grinding and cooling : CIS indexed as (C04B 7/52;C04B 7/47)

References

Limiting references

This place does not cover:

Hydrating ground clinker	C04B 7/51
Still contains grinding aids	C04B 7/52
Grinding aids	are classified as active ingredients, e.g. in C04B 24/00, and receive C04B 2103/52 as an Indexing Code
Grinding aids in general	B02C 23/06

C04B 7/522

{After-treatment of ground cement (C04B 7/368 takes precedence)}

References

Limiting references

This place does not cover:

Obtaining spherical cement particles in the manufacture of hydraulic cement	C04B 7/368

C04B 7/527

{obtaining cements characterised by fineness, e.g. by multi-modal particle size distribution}

Definition statement

This place covers:

Cements characterised by fineness obtained by the clinker grinding e.g. "micro-cement": particles with diameter smaller than 15 micrometer

References

Limiting references

This place does not cover:

Unground clinker	C04B 7/006

C04B 7/60

Methods for eliminating alkali metals or compounds thereof, {e.g. from the raw materials or during the burning process; methods for eliminating other harmful components (avoiding environmental pollution C04B 7/364)}

References

Limiting references

This place does not cover:

Avoiding environmental pollution	C04B 7/364

Informative references

Attention is drawn to the following places, which may be of interest for search:

For aspects relating to cement kiln dust	C04B 7/436, C04B 18/162

C04B 9/00

Magnesium cements or similar cements

Definition statement

This place covers:

Cements are based on magnesium, e.g. Mg oxychloride, Mg oxysulfate; Preparation thereof;

Special rules of classification

CIS is used only incidentally in this class. If so, index codes are chosen from other C04B 9/00 groups and C04B. A C04B 9/00 index code in a CIS set having a C04B 28/00 EC class indicates the presence of a second binder.

C04B 9/20

Manufacture, e.g. preparing the batches (preheating, burning, calcining or cooling lime stone, magnesite or dolomite C04B 2/10)

Definition statement

This place covers:

Process of manufacturing magnesium cements or similar cements, e.g. burning, calcining

References

Limiting references

This place does not cover:

Preheating, burning, calcining or cooling lime stone, magnesite or dolomite	C04B 2/10

C04B 11/00

Calcium sulfate cements

Definition statement

This place covers:

Calcium sulfate cements,

e.g. Natural forms of CaSO4.2H2O: SELENITE, MARIAGLAS, TERRA ALBA,SATINITE, ALABASTER;

e.g. MORMOR CEMENT = Ca-sulphate;

e.g. MACK´S CEMENT = plaster of Paris + K2SO4 or Na2SO4;

e.g. LANDPLASTER = CaSO4.2H2O ;

e.g. aging of calcined gypsum

Special rules of classification

CIS is used only incidentally in this class. If so, index codes are chosen from other C04B 11/00 groups and C04B.

C04B 11/02

{Methods and apparatus for} dehydrating gypsum {(for other purposes than cement manufacture C01F 11/466)}

Definition statement

This place covers:

Methods and apparatus for dehydrating gypsum,

e.g. PLASTER = mostly alpha + beta.

e.g. regeneration of gypsum molds: (classification being //(C04B 11/02; C04B 11/262) or other way around)

References

Limiting references

This place does not cover:

Drying alpha-hemihydrate	C04B 11/032
Calcining in general	B01J 6/00
For other purposes than cement manufacture	C01F 11/466

C04B 11/032

for the wet process, e.g. dehydrating in solution or under saturated vapour conditions, {i.e. to obtain alpha-hemihydrate (C04B 11/0281 - C04B 11/0288 take precedence)}

Definition statement

This place covers:

e.g. drying of alpha-gypsum;

e.g. quick setting alpha-plaster + K2CO3;

Relationships with other classification places

used for making moulds for the ceramic industry.

Moulds are classified in B29C in combination with B29K index scheme

References

Limiting references

This place does not cover:

Attention	C04B 11/02
Take precedence	C04B 11/0281 - C04B 11/0288

Special rules of classification

The presence of C04B 11/032 in a c-set indicates that alpha-hemihydrate form is used

C04B 11/036

for the dry process, e.g. dehydrating in a fluidised bed or in a rotary kiln, {i.e. to obtain beta-hemihydrate (C04B 11/0281 - C04B 11/0288 take precedence)}

Definition statement

This place covers:

Devices for the dry process of dehydrating gypsum

References

Limiting references

This place does not cover:

C04B 11/0281 - C04B 11/0288 take precedence

Special rules of classification

The presence of C04B 11/036 in a c-set indicates that beta-hemihydrate form is used

C04B 12/00

Cements not provided for in groups C04B 7/00 - C04B 11/00

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Alkali metal silicates per se and their preparation	C01B 33/32
Ammonium silicates per se and their preparation	C01C 1/00

C04B 12/02

Phosphate cements (in, or for, the manufacture of ceramics C04B 33/00, C04B 35/00)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

In or for the manufacturing of ceramics	C04B 33/00, C04B 35/00

C04B 14/00

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone (expanding or defibrillating materials C04B 20/00)

Definition statement

This place covers:

Inorganic materials used ad fillers for mortars, concrete or artificial stone, and their treatment to enhance their filling properties e.g. inorganic pigments other than oxides;

C04B 14/00 and subgroups are used as substrate codes for coatings of natural stone

References

Limiting references

This place does not cover:

Oxide pigments	C04B 14/30 and subgroups
Expanding or defibrillating materials	C04B 20/00

C04B 14/022

{Carbon}

Definition statement

This place covers:

Carbon used as fillers for mortar, concrete or artificial stone, elemental carbon, e.g. COKE, KOKS (=90%C), LIGNITE, COCKES, "TEERKOKS";

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

"MINERAL NOIR" = shale (70% SiO2, 30%C) = coal black = " NOIRMINER" = "NOIR D´ IVOIRE"

C04B 14/04

Silica-rich materials; Silicates

Definition statement

This place covers:

Silica-rich materials, silicates used as fillers for mortars, concrete or artificial stone

e.g. "LOESS";

e.g. GREYWACKE, GRAYWACKE = conglomerate rock (round pebbles + sand, cemented together.)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Clay	C04B 14/10

C04B 14/042

{Magnesium silicates, e.g. talc, sepiolite}

Definition statement

This place covers:

Magnesium silicates used as fillers for mortars, concrete or artificial stone,

e.g. SEPIOLITE; ASBESTINE

C04B 14/045

{Alkali-metal containing silicates, e.g. petalite (waterglass C04B 12/04)}

Definition statement

This place covers:

Alkali-metal containing silicates, Al-alkali metal silicates used as fillers for mortars, concrete or artificial stone,

e.g. PETALITE Li2O.Al2O3.8SiO2;

e.g. SPODUMENE LiO2.Al2O3.4SiO2;

e.g. EUCRYPTITE LiO2.Al2O3.2SiO2;

e.g. NEPHELINE SYENITE;

e.g. MAGADIITE

References

Limiting references

This place does not cover:

Waterglass	C04B 12/04

C04B 14/06

Quartz; Sand

Definition statement

This place covers:

Quartz, sand used as filler for mortar, concrete or artificial stone,

e.g. SILICA (SiO2) is polymorphic i.e. capable of existing in two or more crystal forms. Main forms of crystalline silica : QUARTZ,TRIDYMITE, CRISTOBALITE.

e.g. vitreous silica, amorphous silica;

e.g. precipitated silica; pyrogenic silica;

e.g. SILT = fine sand;

e.g. CHERT; FLINT; MOLDING SAND;

C04B 14/062

{Micro-silica, e.g. colloïdal silica (preparing micro-silica slurries or suspensions C04B 18/148)}

Definition statement

This place covers:

micro-silica used as filler for mortar, concrete or artificial stone, e.g. colloidal silica 0.001-0.2 microns

References

Limiting references

This place does not cover:

C04B 18/146, C04B 12/04 take precedence

Preparing micro-silica slurries or suspensions	C04B 18/148

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Micro-silica	Silica having micro or nano size particles

C04B 14/064

{Silica aerogel}

Definition statement

This place covers:

Silica aerogel used as filler for mortar, concrete or artificial stone,

e.g. silica aerogel being obtained by forming a SiO2 gel impregnated with a solvent, and evaporating the solvent under hypercritical conditions

C04B 14/068

{Specific natural sands, e.g. sea -, beach -, dune - or desert sand}

Definition statement

This place covers:

Specific natural sands used as filler for mortar, concrete or artificial stone, e.g. BARKHAN SAND, BARHAN SAND

C04B 14/08

Diatomaceous earth

Definition statement

This place covers:

Diatomaceous earth used as filler for mortar, concrete or artificial stone,

e.g. hydrated amorphous silica, skeletons of Diatomacea which are related to brown algae

e.g. INFUSORIAL EARTH;

e.g. TRIPOLITE;

e.g. FOSSIL FLOUR,, MOUNTAIN FLOUR;

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

FOSSIL FLOUR= FARINE FOSSILE= MOUNTAIN FLOUR

KIESELGUHR, KIESELMEHL

"DIATOMEEN PELITE";

"MOLERERDE"

BERGHMEHL

C04B 14/10

Clay {(sepiolite C04B 14/042; grog C04B 18/025)}

Definition statement

This place covers:

Clay used as filler for mortar, concrete or artificial stone,

e.g. Al silicates;

e.g. BALL CLAY;;FULLERS EARTH;;

e.g. MARL;

e.g. PORCELANITE

References

Limiting references

This place does not cover:

Sepiolite	C04B 14/042, some older document are in C04B 14/10;
Chamotte, fireclay, fired clay, grog	C04B 18/025 (older documents have a C-set C04B 14/10; C04B 18/023)

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

BALL CLAY= GLAISE = FULLERS EARTH= LEEM;

MERGEL" = "MARNE" = MARL

OCRE

C04B 14/104

{Bentonite, e.g. montmorillonite}

Definition statement

This place covers:

Bentonite, e.g. montmorillonite used as filler for mortar, concrete or artificial stone,

e.g. HECTORITE, synthetic hectorite;

e.g. BLEACHING EARTH, "BLEICHERDE" = Al-Mg-Silikate

References

Limiting references

This place does not cover:

Waste bleaching earth	C04B 18/0454

C04B 14/106

{Kaolin}

Definition statement

This place covers:

Kaolin used as filler for mortar, concrete or artificial stone,

Kaolin is not sintered

e.g. METAKAOLIN, KAOLINITE;

e.g. SMECTITE [9212];

C04B 14/108

{Shale, slate (colliery shale C04B 18/125)}

Definition statement

This place covers:

Shale, slate used as filler for mortar, concrete or artificial stone

References

Limiting references

This place does not cover:

Shale residues, colliery shale	C04B 18/125

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

SHALE = SLATE = "SCHISTE" = "SCHIEFER" = "LEISTEEN" (harde klei) =ARDOISE

C04B 14/12

Expanded clay

Definition statement

This place covers:

Expanded clay used as filler for mortar, concrete or artificial stone

e.g. porous clay; expanded shale;

C04B 14/14

Minerals of vulcanic origin {(granite C04B 14/048)}

Definition statement

This place covers:

Mineral of volcanic origin used as filler for mortar, concrete or artificial stone

e.g. natural pozzuolanes (pozzolana, puzzolan) other than diatomaceous earth;

e.g. IGNEOUS ROCK

e.g. ANDESITE, RHYOLITE, PORFIER;

e.g. OBSIDIAN = vulcanic glass with little or no crystal water;

e.g. TRASS = TUFF = unconsolidated vulcanic ashes;

References

Limiting references

This place does not cover:

Granite	C04B 14/048

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

TUF	porous rock formed from cemented volcanic ashes or from calcareous deposits in lakes or springs

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

IGNEOUS ROCK = "ERGUSSGESTEIN " = "ROCHE EFFUCIVE

UITVLOEIINGS GESTEENTE" = "GESTOLDE LAVA"

"PECHSTEIN" = acidic vulcanic glass;

C04B 14/16

porous, e.g. pumice

Definition statement

This place covers:

Porous minerals of volcanic origin used as filler for mortar, concrete or artificial stone

e.g. PUMICE = porous volcanic rock;

e.g. LIPARITE =(Ca pegmatite) e.g. SHIRAZU, SHIRASU = volcanic ash;

e.g. PUMIZITE = volcanic glass

e.g. SCORIA, CINDER

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

PUMICE = "PIERRE PONCE " = "PUIMSTEEN" = "BIMS"(12mm)

FLUGSAND = like bims but finer (7-10mm);

C04B 14/18

Perlite

Definition statement

This place covers:

Perlite being mineral of volcanic origin used as filler for mortar, concrete or artificial stone e.g. volcanic glass

C04B 14/185

{expanded}

Definition statement

This place covers:

Expanded perlite (mineral of volcanic origin) used as filler for mortar, concrete or artificial stone

e.g. expanded by evaporation of crystal water

C04B 14/20

Mica; Vermiculite {(Mechanical splitting B28D)}

Definition statement

This place covers:

Mica, vermulite used as filler for mortar, concrete or artificial stone

e.g. "GLIMMER", KAl3Si3O10(OH)2;

e.g. BIOTITE = dark or magnesia mica (rich in Mg and Fe);

e.g. MUSCOVITE = (Na,K)2O.3Al2O3.6SiO2.2H2O;

e.g. TRACHYLIPARITE;

e.g. sericite

References

Limiting references

This place does not cover:

Punching of mica	B26F 1/00
Mechanical splitting	B28D
Mica treatment	C09C 1/405
Pulp or paper comprising mica or vermiculite	D21H 13/44

C04B 14/202

{Vermiculite}

Definition statement

This place covers:

Vermiculite used as filler for mortar, concrete or artificial stone

e.g. = hydrated biotite mica (OH)2(Mg Fe)3(SiAlFe)4O10.4H2O;

C04B 14/204

{expanded}

References

Limiting references

This place does not cover:

Delamination of mica	C04B 14/20
Chemical delamination	C04B 14/208

C04B 14/206

{Mica or vermiculite modified by cation-exchange; chemically exfoliated vermiculate}

References

Limiting references

This place does not cover:

Ion exchanged silicates	C01B 33/44

C04B 14/208

{delaminated mica or vermiculite platelets}

References

Limiting references

This place does not cover:

Mechanical delamination	C04B 14/20

C04B 14/22

Glass; {Devitrified glass}

Definition statement

This place covers:

Any type of glass used as filler for mortar, concrete or artificial stone

e.g. recuperated, waste glass;

e.g. frits, email

References

Limiting references

This place does not cover:

Vitreous SiO2	C04B 14/06

C04B 14/24

porous, e.g. foamed glass

References

Limiting references

This place does not cover:

Lightweight materials	C04B 18/027

C04B 14/26

Carbonates

Definition statement

This place covers:

Carbonates used as filler for mortar, concrete or artificial stone

e.g. MAGNESITE, DOLOMITE, "DOLOMIE"

C04B 14/28

of calcium

Definition statement

This place covers:

Carbonates of calcium used as filler for mortar, concrete or artificial stone

e.g. TRIPOLI;

e.g. SHELLS, CORAL, MOTHER OF PEARLS,

e.g. CHALK,

e.g. ICELAND SPAR = pure crystalline calcite (CaCO3)

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

"ARDUIN" = blue stone

Chalk = "NEUBERGER KREIDE", "KIESELKREIDE

C04B 14/30

Oxides other than silica {(ferrites C04B 14/363)}

Definition statement

This place covers:

Oxides other than silica used as filler for mortar, concrete or artificial stone

e.g. simple oxides;

e.g. oxides used as pigments;

References

Limiting references

This place does not cover:

Ferrites	C04B 14/363
Oxides as active ingredients	C04B 22/06

Special rules of classification

used as CIS codes for refractory filler in concrete

C04B 14/303

{Alumina}

Definition statement

This place covers:

Alumina used as filler for mortar, concrete or artificial stone

e.g. Al(OH)3;

e.g. BAUXITE;

References

Limiting references

This place does not cover:

Gelatinous Al(OH)3	C04B 22/06

C04B 14/306

{Zirconium oxide (zircon C04B 14/046)}

References

Limiting references

This place does not cover:

Zircon	C04B 14/046

C04B 14/308

{Iron oxide}

Definition statement

This place covers:

Iron oxide used as filler for mortar, concrete or artificial stone

e.g. CAPUT MORTUUM = ENGLISH RED = Fe_2O_3

C04B 14/36

Inorganic materials not provided for in groups {C04B 14/022 and} C04B 14/04 - C04B 14/34

Definition statement

This place covers:

Inorganic materials not classified in groups C04B 14/022, C04B 14/04 - C04B 14/34 used as filler for mortar, concrete or artificial stone

e.g. mineral salt (NaCl);

e.g. LITHOPONE = $BaSO_4$ + ZnS (=pigment);

e.g. SPINEL = $MgAl_2O_4$

C04B 14/361

{Soil, e.g. laterite}

Definition statement

This place covers:

Soil used as filler for mortar, concrete or artificial stone

e.g. mud, sapronel, laterite

References

Limiting references

This place does not cover:

Harbour/river sludge	C04B 18/0436

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

mud, sapronel, = "Faulschlamm

C04B 14/38

Fibrous materials; Whiskers

References

Limiting references

This place does not cover:

Fibres in general	D01

C04B 14/386

{Carbon (carbon nanotubes C04B 14/026)}

References

Limiting references

This place does not cover:

Carbon nanotubes	C04B 14/026
Fabrication of carbon fibres	D01F 9/12

C04B 14/40

Asbestos

References

Limiting references

This place does not cover:

- treating asbestos fibres see D06M 7/005, D02G 3/20;

- coating of asbestos in general see C03C 25/00;

- coating of asbestos CIS example C04B 20/10, C04B 14/40;

- disposal of asbestos see B09B 3/0066;

- asbestos from old buildings CIS example (C04B 14/40, C04B 18/16)

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

CHRYSOTILE (serpentine family)	3MgO.2SiO2.2H2O
CROCIDOLITE (amphibole family)	BLUE ASBESTOS3Na2O.6FeO.2Fe2O3.16SiO2.H2O
AMOSITE (amphibole family)	2Ca.5MgO.8SiO2.H2O
TREMOLITE	amphibole family
ANTHOPHYLLITE	$(Mg,Fe)_7Si_8O_{22}(OH)_2$
ASBESTINE	fibrous variety of talc +tremolite

C04B 14/42

Glass

Definition statement

This place covers:

Glass fibers, glass whiskers used as filler for mortar, concrete or artificial stone

References

Limiting references

This place does not cover:

Composition of (alkali-resistant) glass fibres	C03C 13/00
Coating glass fibres used for cement reinforcement	C03C 25/10
Glass fibres for resin matrix	C08J 5/08

C04B 14/44

Treatment for enhancing alkali resistance {(composition of alkali resistant glass fibres C03C 13/00; coating of glass fibres C03C 25/10)}

References

Limiting references

This place does not cover:

Composition of alkali resistant glass fibres	C03C 13/00
Coating of glass fibres	C03C 25/10

C04B 14/46

Rock wool; {Ceramic or silicate fibres (C04B 14/40, C04B 14/42 take precedence)}

References

Limiting references

This place does not cover:

Take precedence	C04B 14/40, C04B 14/42
Ceramic fibres as such	C03C 13/00, C04B 35/62227

C04B 14/4618

{Oxides}

Definition statement

This place covers:

Oxides , hydroxides of rock wool used as filler for mortar, concrete or artificial stone

References

Limiting references

This place does not cover:

TiO2	C04B 14/4681

C04B 14/4681

{Titanates}

Definition statement

This place covers:

Titanates, TiO2 of rock wool used as filler for mortar, concrete or artificial stone

C04B 16/02

Cellulosic materials (cellulosic waste materials, e.g. sawdust, rice husks, C04B 18/24)

References

Limiting references

This place does not cover:

Cellulosic fibres	C04B 18/24
Cellulosic waste materials, e.g. sawdust, rice husks	C04B 18/24

C04B 16/04

Macromolecular compounds (C04B 16/02 takes precedence)

Definition statement

This place covers:

Macromolecular organic compounds used as filler for mortar, concrete or artificial stone e.g. glass-clear thermoplastic MBS resin (methacrylate-butadiene-styrene) for packaging , medical applications

References

Limiting references

This place does not cover:

Cellulosic materials as fillers for mortars, concrete or artificial stone	C04B 16/02

C04B 16/06

fibrous

Definition statement

This place covers:

Fibrous organic macromolecular compounds used as filler for mortar, concrete or artificial stone

e.g. regenerated cellulose fibers;

e.g. textile waste,

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

textile waste="Textilschnitzel"

C04B 16/0608

{Fibrilles, e.g. fibrillated films}

Definition statement

This place covers:

Fibrilles used as filler for mortar, concrete or artificial stone

e.g. polyalkanes;

e.g. stretched films,

e.g. "pulp" aramid fibers = very short , highly fibrillated with very fine fibrils or subfibers attached to core fibre

References

Limiting references

This place does not cover:

Fibrillated films in general	D01D 5/42

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

stretched films= films "etirés"

C04B 16/0691

{Polyamides; Polyaramides}

Definition statement

This place covers:

Fibrilles of polyamaide, of polyaramides used as filler for mortar, concrete or artificial stone e.g. aromatic polyetheramide fibers;

e.g. ARAMID fibers = poly (p-phenylene terephtalamide)

e.g. NYLON = aliphatic polyamide

C04B 16/08

porous, e.g. expanded polystyrene beads {or micro-balloons}

Definition statement

This place covers:

Porous organic macromolecular compounds used as filler for mortar, concrete or artificial stone

e.g. PS, EPS;

e.g. expanded PS

References

Limiting references

This place does not cover:

Working up macromolecular substances to porous or cellular articles or materials	C08J 9/00

C04B 16/10

Treatment for enhancing the mixability with the mortar {(coating C04B 20/10)}

References

Limiting references

This place does not cover:

Takes precedence	C04B 20/10

C04B 16/12

characterised by the shape (fibrous macromolecular compounds C04B 16/06; porous macromolecular compounds C04B 16/08), {e.g. perforated strips}

Definition statement

This place covers:

Organic materials used as fillers for mortar, concrete or artificial stone characterised by their shape

References

Limiting references

This place does not cover:

Fibrous macromolecular compounds	C04B 16/06
Porous macromolecular compounds	C04B 16/08
Only characterised by the form	E04C

C04B 18/00

Use of agglomerated or waste materials or refuse as fillers for mortars, concrete or artificial stone (use of waste materials for the manufacture of cement C04B 7/24); Treatment of agglomerated or waste materials or refuse, specially adapted to enhance their filling properties in mortars, concrete or artificial stone

References

Limiting references

This place does not cover:

Use of waste materials for the manufacture of cement	C04B 7/24
Granulating materials in general	B01J 2/00
Making micro-capsules or micro-balloons	B01J 13/00

C04B 18/02

Agglomerated materials, {e.g. artificial aggregates}

References

Limiting references

This place does not cover:

Conditioning silica fume	C04B 18/147

Informative references

Attention is drawn to the following places, which may be of interest for search:

Temporary compacting of cement	C04B 7/36,
Temporary compacting of gypsum	C04B 11/268
Making unhardened granules, mixing these granules, molding and hardening	C04B 40/0028 (C04B 18/02 has been used as CIS code in this meaning)

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Artificial aggregates/synthetic aggregates	aggregates which are not "natural" in the way that crushed rocks or sands and gravels are. It implies human-made materials, whether by-products of some other industry or deliberately manufactured

C04B 18/021

{agglomerated by a mineral binder, e.g. cement}

References

Limiting references

This place does not cover:

Takes precedence	C04B 18/027
Waste from building industry	C04B 18/16

Special rules of classification

For agglomerated materials (=artificial aggregates or fillers) which are classified in C04B 18/021 or other equivalent subgroups of C04B 18/00, the starting materials other than the binder can be identified in the C-set with Indexing Codes. Codes are chosen form C04B 14/00, C04B 16/00, C04B 18/00 and less often from C04B 22/00 or C04B 24/00.

C04B 18/022

{agglomerated by an organic binder}

References

Limiting references

This place does not cover:

Still to be cleaned	C04B 18/022
Takes precedence;	C04B 18/027

Special rules of classification

See rules under C04B 18/021

C04B 18/023

{Fired or melted materials (C04B 20/06 takes precedence)}

Definition statement

This place covers:

Agglomerated materials wherein a melting or firing step takes place during the agglomeration.

References

Limiting references

This place does not cover:

Porous fired material	C04B 18/027 (+ C-set code C04B 18/023)
Expanding clay, perlite, vermiculite or like granular materials used as fillers for mortars, concrete or artificial stone	C04B 20/06

Informative references

Attention is drawn to the following places, which may be of interest for search:

Expanded clay	C04B 14/12
Pelletizing fly ash	C04B 18/085
Porous or hollow ceramic granular material	C04B 38/009

Special rules of classification

See rules under C04B 18/021

C04B 18/025

{Grog}

Definition statement

This place covers:

Grog used as fillers for mortars, concrete or artificial stone

e.g. crushed refactory materials added to ceramic mixes to reduce lamination in clays and shrinkage on drying,

e.g. crushed pottery, firekrick, quartz quartzite, burned ware, saggers;

e.g. CHAMOTTE, FIRED CLAY, FIRECLAY as filler for concrete

Special rules of classification

Before [9105] documents were classified in C04B 14/10 and received C04B 20/04 index code in the C-set

C04B 18/026

{Melted materials (C04B 14/22 takes precedence)}

Definition statement

This place covers:

Agglomerated materials wherein a melting step takes place during the agglomeration

References

Limiting references

This place does not cover:

Glass, devitrified glass used as filler for mortar, concrete or artificial stone	C04B 14/22

C04B 18/027

{Lightweight materials (C04B 14/12 takes precedence)}

Definition statement

This place covers:

Low density or porous agglomerated material used as filler for mortar, concrete or artificial stone

References

Limiting references

This place does not cover:

C04B 14/12 takes precedence

Informative references

Attention is drawn to the following places, which may be of interest for search:

Expanded clay	C04B 14/12
Porous glass	C04B 14/24
Expanding clay, vermiculite, perlite	C04B 20/06
Porous or hollow ceramic granular material	C04B 38/009

Special rules of classification

for crushed porous concrete aggregate ("Gasbetonbruch Zuschlag") , one set of codes with C04B 18/027 or C04B 38/00 and an alternative with C04B 18/16

C04B 18/04

Waste materials; Refuse {(C04B 14/405 takes precedence)}

Definition statement

This place covers:

Waste materials, refuse, e.g. from industrial or other processes that are not covered by the subgroups

e.g. Si-Stoff;

e.g. mixtures of wastes

References

Limiting references

This place does not cover:

Waste added during the cement production i.e. in the kiln raw materials	C04B 7/24 or C04B 7/14
Waste glass	C04B 14/22
Waste asbestos	C04B 14/405
Making harmful chemical agents harmless	A62D 3/00 and subgroups
Disposal of asbestos	B09B 3/0066
Solidification of liquid or solid radioactive waste	G21F 9/16, G21F 9/34

Informative references

Attention is drawn to the following places, which may be of interest for search:

Solidification of sludges	C02F 11/008,

C04B 18/0409

{Waste from the purification of bauxite, e.g. red mud}

Definition statement

This place covers:

Waste from the purification of bauxite used as filler for mortar, concrete or artificial stone

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

treatment of waste from aluminium production	C01F 7/066

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Red mud, red sludge	solid waste product of the Bayer process, composed of a mixture of solid and metallic oxide-bearing impurities (high content of oxidised iron)

C04B 18/0427

{Dry materials}

Definition statement

This place covers:

Dry waste materials used as fillers for mortars, concrete or artificial stone,

Wet waste materials that is dried before use as fillers for mortars, concrete or artificial stone

C04B 18/0436

{Dredged harbour or river sludge (other slurries or sludges C04B 18/0418)}

References

Limiting references

This place does not cover:

Other slurries or sludges	C04B 18/0418

Informative references

Attention is drawn to the following places, which may be of interest for search:

Soil	C04B 14/361
Waste materials in general	C04B 18/04

C04B 18/0445

{Synthetic gypsum, e.g. phosphogypsum (gypsum from smoke purification C04B 18/064)}

Definition statement

This place covers:

Synthetic gypsum form waste material used as filler for mortars, concrete or artificial stone.

References

Limiting references

This place does not cover:

Gypsum from smoke purification	C04B 18/064

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Synthetic gypsum, flue-gas desulfurisation gypsum	byproduct of coal-fired power plants (coal burned with flue gas desulfurisation)

C04B 18/0454

{Bleaching earth}

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Bleaching earth	(waste) bleaching earth is used as absorbent material for cleaning/ bleaching of mineral, natural oils, fats and waxes. After the use it becomes "fat" bleaching earth. The fats/oils are removed as much as possible by boiling with soda and salt giving a low fat ("mager") bleaching earth

C04B 18/0481

{Other specific industrial waste materials not provided for elsewhere in C04B 18/00}

Definition statement

This place covers:

Other specific industrial waste materials not provided in the other subgroups of C04B 18/00 used as fillers for mortars, concrete or artificial stone

e.g. PYRITE CINDER Fe_2O_3;

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

kiesabbraende

C04B 18/06

Combustion residues, e.g. purification products of smoke, fumes or exhaust gases

Definition statement

This place covers:

Combustion residues used as fillers for mortars, concrete or artificial stone

e.g. bottom ash;

e.g. coal ash, cinders

References

Limiting references

This place does not cover:

Collecting residues from parts of furnace plants	F23J 3/06

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

"SCHMELZKAMMERASCHE", "KESSELASCHE

C04B 18/061

{Ashes from fluidised bed furnaces}

Definition statement

This place covers:

Ashes from fluidised bed furnaces used as fillers for mortars, concrete or artificial stone, e.g. AFBC ashes = atmospheric fluidised bed combustion ashes

Special rules of classification

fly ashes from fluidised bed furnaces take two alternative sets of codes one with C04B 18/061 and one with C04B 18/08

C04B 18/065

{Residues from coal gasification}

Definition statement

This place covers:

Residues from coal gasification used as fillers for mortars, concrete or artificial stone

e.g. residues from the partial oxidation of coal

C04B 18/08

Flue dust, {i.e. fly ash}

Definition statement

This place covers:

Flue dust, fly ash used as fillers for mortars, concrete or artificial stone

flu

e.g. PFA = Pulverised Fuel Ash;

e.g. EFA = ElectroFilter Ash ("elektrofilter Abzug");

e.g. HVFA = High Volume Fly Ash ";

e.g. Class F fly ash: pozzolanic,usually from bituminous coal, low Ca, glass part is reactive with cement;

e.g. Class C fly ash: pozzolanic and cementitious, normally from lignite or sub. bituminous coal;

e.g. Class N fly ash;

References

Limiting references

This place does not cover:

Slaking of lime in the presence of fly ash	C04B 2/06

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Flue dust	by-product of the burning of pulverised coal

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

" ElectroFilter Ash = elektrofilter AbzugHigh Volume Fly Ash= cendres volantes

"Steinkohlefilterasche

C04B 18/081

{from brown coal or lignite}

Definition statement

This place covers:

Flue dust from brown coal or lignite used as filler for mortars, concrete or artificial stone,

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

Lignite fly ash = Braunkohlefilterasche"

C04B 18/082

{Cenospheres}

Definition statement

This place covers:

Cenospheres used as fillers for mortars, concrete or artificial stone,

e.g. = floating fraction of PFA = hollow spheres (20-200micron) of aluminosilicate glass;

e.g. ARMOSPHERES, FILLITE, EXTENDOSPHERES

C04B 18/085

{Pelletizing}

Definition statement

This place covers:

Pelletizing fuel dust used as filler for mortars, concrete or artificial stone,

Melting fuel dust to form aggregate;

e.g. sintered PFA

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

For LYTAG	C04B 14/12
Agglomerated fired materials	C04B 18/023
Expanding clay, vermiculite, perlite and the like	C04B 20/06

C04B 18/10

Burned {or pyrolised} refuse

Definition statement

This place covers:

Burned or pyrolised refuse used as filler for mortars, concrete or artificial stone,

e.g. MSW = municipal solid waste;

e.g. slags from waste incineration;

e.g. burned paper processing waste

References

Limiting references

This place does not cover:

Burned refuse in cement manufacturing	C04B 7/28

Incineration of waste	F23G 5/00

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

Clinker = machefer

C04B 18/101

{Burned rice husks or other burned vegetable material}

Definition statement

This place covers:

Burned rice husks or other burned vegetable material used as filler for mortars, concrete or artificial stone

e.g. expanded rice hull ash, reburned rice hull ash

C04B 18/103

{Burned or pyrolised sludges}

Definition statement

This place covers:

Burned or pyrolised sludges used as filler for mortars, concrete or artificial stone,

e.g. SSA = SEWAGE SLUDGE ASH / SLAG

C04B 18/105

{Gaseous combustion products or dusts collected from waste incineration, e.g. sludge resulting from the purification of gaseous combustion products of waste incineration}

Definition statement

This place covers:

Gaseous combustion products or dusts collected from waste incineration used as filler for mortars, concrete or artificial stone,

e.g. AQCS =Air quality combustion system = fly ash + desulfurisation products

C04B 18/12

from quarries, mining or the like

Definition statement

This place covers:

Waste materials form quarries, mining or the like used as filler for mortars, concrete or artificial stone.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

Tailings = BERGE", "BERGEMATERIAL", "GRUBENBERGE", "WASCHBERGE

C04B 18/14

from metallurgical processes (treatment of slag C04B 5/00; for manufacture of cement C04B 7/14)

Definition statement

This place covers:

Waste materials from metallurgical processes used as filler for mortars, concrete or artificial stone

e.g. nephelin slurry" (=from Al-production)

References

Limiting references

This place does not cover:

Treatment of slag	C04B 5/00
For manufacture of cement	C04B 7/14

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

Nephelin slurry = NEPHELIN SCHLAMM

C04B 18/141

{Slags}

Definition statement

This place covers:

Slags from metallurgical processes used as filler for mortars, concrete or artificial stone, e.g. blast furnace slag;

e.g. cupola slag, "

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

cupola slag = KUPOLOFENSCHLACKE

C04B 18/146

{Silica fume}

Definition statement

This place covers:

Filter dust from silicon metal or ferrosilicon alloy production;

(non-thixotropic)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Thixotropic silica fume e.g. CAR-BO-SIL	C04B 14/062

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- "MICRO-SILICA", "ferrosilicon dust", "silica flue dust" and "amorphous silica"

C04B 18/149

{other than silica fume or slag}

Definition statement

This place covers:

Waste materials from metallurgical processes other than silica fume or slag used as filler for mortars, concrete or artificial stone,

e.g. EAFD, electric arc furnace dust

C04B 18/16

from building or ceramic industry {(separating plants for waste concrete slurry B03B 9/063)}

Definition statement

This place covers:

Waste materials from building or ceramic industry used as filler for mortars, concrete or artificial stone,

e.g. reclaiming cement slurry;

e.g. broken ceramic tiles

References

Limiting references

This place does not cover:

Separating of concrete slurry as refuse	B03B 9/063

Informative references

Attention is drawn to the following places, which may be of interest for search:

Materials agglomerated by a mineral binder	C04B 18/021
Lightweight materials	C04B 18/027

Special rules of classification

foamed concrete as aggregate : two sets of codes , one with C04B 18/16 and one with C04B 18/027

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

"CASSONS" = broken ceramic tiles

C04B 18/162

{Cement kiln dust; Lime kiln dust}

Definition statement

This place covers:

Cement kiln dust, lime kiln dust used as filler for mortars, concrete or artificial stone

Any other dust resulting from cement production

References

Limiting references

This place does not cover:

Recuperation of cement kiln dust during cement fabrication	C04B 7/436

C04B 18/18

organic (C04B 18/10 takes precedence)

Definition statement

This place covers:

Organic waste materials used as filler for mortars, concrete or artificial stone,

e.g. HAIR, FEATHERS, LEATHER;

e.g. MANURE, MEST;

e.g. wool fibers

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

. MANURE= LISIER= GUELLE,= MEST

C04B 18/20

from macromolecular compounds {(recycled expanded polystyrene C04B 16/08)}

References

Limiting references

This place does not cover:

Recycled expanded polystyrene	C04B 16/08
Recovery from working up of polymers	C08J 11/04

C04B 18/24

Vegetable refuse, e.g. rice husks, maize-ear refuse; Cellulosic materials, e.g. paper, {cork}

Definition statement

This place covers:

Vegetable refuse, cellulosic materials used as fillers for mortar, concrete or artificial stone

e.g. CORK, SISAL, PEAT, KAPOK;

e.g. VEGETABLE IVORY = CORAJO = TAGUA;

e.g. COMPOST;

e.g. expanded cellulosic material i.e. puffed rice, popcorn is classified in this group and received the C-set containing C04B 20/06

References

Limiting references

This place does not cover:

Processing, machining of boards fabricated from pressed wood fibers	**B29J5/00**
Regenerated cellulose fibers	C04B 16/06 (C04B 18/24 still to be cleaned)
"Spaanplaten"	C08L 97/02

C04B 18/241

{Paper, e.g. waste paper; Paper pulp}

Definition statement

This place covers:

Paper products used as fillers for mortar, concrete or artificial stone,

e.g. pulp from bark;

e.g. waste paper

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Still contains older documents	C04B 18/24
Wood pulp	C04B 18/26

C04B 18/243

{Waste from paper processing or recycling paper, e.g. de-inking sludge (burned paper processing waste C04B 18/10)}

References

Limiting references

This place does not cover:

Waste paper itself	C04B 18/241

C04B 18/245

{Cork; Bark}

Definition statement

This place covers:

Cork, bark used as filler for mortars, concrete or artificial stone

wood and bark are not synonymous, wood used as filler being classified in C04B 18/26

References

Limiting references

This place does not cover:

Mechanical working of cork	B27J 5/00

C04B 18/248

{from specific plants, e.g. hemp fibres}

References

Limiting references

This place does not cover:

Peat, algae	C04B 18/24

C04B 18/26

Wood, e.g. sawdust, wood shavings

Definition statement

This place covers:

Wood used as fillers for mortars, concrete or artificial stone,

e.g. BAMBOO;

e.g. ARBOLITE = wood chips/waste cement boards;

e.g. FIBROLITE = wood wool cement boards

C04B 18/28

Mineralising; Compositions therefor

Definition statement

This place covers:

Mineralising vegetable refuse, compositions therefor used as filler for mortars, concrete or artificial stone

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

With organic materials	C04B 20/1018, older documents still present in C04B 18/28.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Mineralising	Treatment with a mineral substance

C04B 18/30

Mixed waste; Waste of undefined composition, (C04B 18/10 takes precedence)

References

Limiting references

This place does not cover:

Takes precedence	C04B 18/10

C04B 20/0008

{Materials specified by a shape not covered by C04B 20/0016 - C04B 20/0056, e.g. nanotubes}

References

Limiting references

This place does not cover:

Reinforcing elements for concrete	E04C 5/01

Informative references

Attention is drawn to the following places, which may be of interest for search:

Nanotechnology for materials or surface science; Manufacture or treatment of nano-structures	B82Y 30/00, B82Y 40/00

C04B 20/002

{Hollow or porous granular materials}

References

Limiting references

This place does not cover:

Lightweight agglomerated material,	C04B 18/027
Hollow or porous ceramic granular material	C04B 38/009

Special rules of classification

hollow or porous particles of specific composition are classified according to the composition and receive C04B 20/002 as CIS code;

C04B 20/0048

{Fibrous materials}

Definition statement

This place covers:

e.g. mixtures of different fibres; when the specific fibre type is not so important

e.g. FIBRE = relatively short;

e.g. FILAMENT = (quasi-)endless;

e.g. YARN = united assembly of fibres (e.g. by spinning);

e.g. THREAD = assembly of yarns or filaments

C04B 20/0052

{Mixtures of fibres of different physical characteristics, e.g. different lengths}

Definition statement

This place covers:

Mixtures of fibres of different physical characteristics used as materials for mortars, concrete or artificial stone

e.g. by twisting

C04B 20/0076

{characterised by the grain distribution}

Definition statement

This place covers:

Materials used as fillers for mortars, concrete or artificial stone according to more than one of groups C04B 14/00 - C04B 18/00 and characterised by the grain distribution

e.g. fine aggregate < 5mm, coarse aggregate > 5mm,

mortar: no coarse aggregate,

concrete: >50% coarse aggregate;

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Granulometry 0/3	material less than or equal to 3mm

C04B 20/02

Treatment

Definition statement

This place covers:

Treatment of materials used as fillers for mortars, concrete or artificial stone according to more than one of the groups C04B 14/00 - C04B 18/00 specially adapted to enhance their filling properties

e.g. removing dust from particles;

e.g. getting round particles (e.g. scrap glass)

References

Limiting references

This place does not cover:

cation exchange of vermiculite	C04B 14/206
Temporary compaction/granulation	C04B 18/028

C04B 20/04

Heat treatment

Definition statement

This place covers:

Heat treatment of materials according to more than one of the groups C04B 14/00 - C04B 18/00 specially adapted to enhance their filling properties in mortars, concrete or artificial stone

e.g. drying

C04B 20/063

{by grate sintering}

Definition statement

This place covers:

Expanding clay, perlite, vermiculite or like granular materials by grate sintering to enhance their filling properties in mortars, concrete or artificial stone

e.g. Blast roasting=Dwight-Lloyd process

References

Limiting references

This place does not cover:

Grate sintering of ores or scrap F27B 21/06	C22B 1/20
Endless-strand sintering apparatus	F27B 21/06

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

Saugzugsinteranlage = Dwight-Lloyd

C04B 20/065

{in fluidised beds}

Definition statement

This place covers:

Expanding clay, perlite, vermiculite or like granular materials in fluidised beds to enhance their filling properties in mortars, concrete or artificial stone

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

Wirbelschicht = fluidised beds

C04B 20/068

{Selection of ingredients added before or during the thermal treatment, e.g. expansion promoting agents or particle-coating materials}

References

Limiting references

This place does not cover:

- expanded clay- see also C04B 18/027	C04B 14/12

Informative references

Attention is drawn to the following places, which may be of interest for search:

Expanded aggregates	C04B 18/027

C04B 20/08

Defibrilating asbestos {(defibrillating other fibres C04B 20/026)}

Definition statement

This place covers:

Defibrillating asbestos to enhance its filling properties in mortars, concrete or artificial stone

e.g. dispersing, flocculating asbestos;

e.g. separating asbestos from bearing material, ores

References

Limiting references

This place does not cover:

"opening" fibres in general	D01G 9/00
Carding machines	D01G 15/02
Defibrillating other fibres	C04B 20/026

C04B 20/10

Coating or impregnating {(roofing granules E04D 7/005)}

References

Limiting references

This place does not cover:

Mineralising wood	C04B 18/28
Coating glass fibres, asbestos or other mineral fibres	C03C 25/00
Roofing granules	E04D 7/005

Special rules of classification

if a mixture is used for the coating: last place rule applies , add C04B 20/10+ codes for other ingredients in the C-set

C04B 20/1018

{with organic materials (pigments or dyes C04B 20/1096)}

References

Limiting references

This place does not cover:

Coating with pigments or dyes	C04B 20/1096

C04B 20/1029

{Macromolecular compounds}

Definition statement

This place covers:

Coating or impregnating with macromolecular compounds materials according to more than one of the groups C04B 14/00 - C04B 18/00 to enhance their filling properties in mortars, concrete or artificial stone

e.g. polymer + pigment

C04B 20/1051

{Organo-metallic compounds; Organo-silicon compounds, e.g. bentone}

Definition statement

This place covers:

Coating or impregnating with organo-metallic compounds, organo-silicon compounds, materials according to more than one of the groups C04B 14/00 - C04B 18/00 to enhance their filling properties in mortars, concrete or artificial stone

e.g. with BENTONE

C04B 20/1074

{Silicates, e.g. glass}

Definition statement

This place covers:

Coating or impregnating with silicates, materials according to more than one of the groups C04B 14/00 - C04B 18/00 to enhance their filling properties in mortars, concrete or artificial stone

e.g. SAND, SILICA FUME, GLASS

References

Limiting references

This place does not cover:

Waterglass	C04B 20/1077

C04B 20/1092

{with pigments or dyes (C04B 20/1059 takes precedence)}

References

Limiting references

This place does not cover:

Coating with pigments or precursors thereof , materials according to more than one of the groups C04B 14/00 - C04B 18/00 to enhance their filling properties in mortars, concrete or artificial stone	C04B 20/1059

C04B 20/12

Multiple coating or impregnating

Special rules of classification

Groups C04B 20/123 and C04B 20/126 are used for indexing purposes only in C04B 20/12 to indicate:

-in the case of C04B 20/123 that a coating is an alternative to the previous indexed coating; example:

C04B 20/12%; C04B 18/22; C04B 20/1037

C04B 20/12%; C04B 18/22; C04B 20/1033; C04B 20/123

C04B 20/12%; C04B 18/22; C04B 20/1055

-in the case of C04B 20/126 that the coating layer is the same as a previous coating layer; example:

C04B 20/12%; C04B 18/22; C04B 20/1037

C04B 20/12%; C04B 18/22; C04B 20/1033

C04B 20/12%; C04B 18/22; C04B 20/1037; C04B 20/126

C04B 22/00

Use of inorganic materials as active ingredients for mortars, concrete or artificial stone, e.g. accelerators {, shrinkage compensating agents}

Definition statement

This place covers:

Inorganic materials used as active ingredients for mortars, concrete or artificial stone,

e.g. HYDRAZINE, NH2NH2;

e.g. SILICATES;

e.g. HYDROALUMITE 3CaO.Al2O3.CaX2.nH2O, X = (NO3, NO2, OH, CH3COO, CO3,SO4)

References

Limiting references

This place does not cover:

Alkali metal silicates	C04B 12/04
zeolites	C04B 14/047 (older documents still in C04B 22/00)

Special rules of classification

Inorganic active ingredients as components of a cementitious mixture are indexed in the CIS database using entries from C04B 22/00. Classification in C04B 22/00 and subgroups is made when these ingredients are (or suspected to be) new or unusual or special details describing this ingredient are given.

C04B 22/0006

{Waste inorganic materials}

References

Limiting references

This place does not cover:

Nitre cake	C04B 22/14

Special rules of classification

used as code to indicate that another C04B 22/00 ingredient is a wasteproduct

C04B 22/0013

{Boron compounds}

Definition statement

This place covers:

Boron compounds, e.g. fluoro-boron compounds used as active ingredients for mortars, concrete or artificial stone,

References

Limiting references

This place does not cover:

organic boron compounds	C04B 24/006

C04B 22/002

{Water}

Definition statement

This place covers:

e.g. magnetised water

e.g. ionized water

e.g. alkali-ion water

Special rules of classification

This class is given as an index in a C-set or as a class only when very particular aspects of the mixing water are given

C04B 22/004

{containing dissolved additives or active agents, i.e. aqueous solutions used as gauging water (C04B 22/0026 takes precedence)}

References

Limiting references

This place does not cover:

Salt water used as active ingredient for mortars, concrete or artificial stone	C04B 22/0026

C04B 22/0093

{Aluminates}

Definition statement

This place covers:

Aluminates used as active ingredient for mortars, concrete or artificial stone

References

Limiting references

This place does not cover:

Calcium sulphoaluminates,	C04B 7/32
Cement or like inorganic materials added as expanding or shrinkage compensating ingredients in mortars or concrete compositions	C04B 22/008

C04B 22/02

Elements

Definition statement

This place covers:

Elements used as active ingredient for mortars, concrete or artificial stone

e.g. Si;

e.g. O_3

C04B 22/04

Metals, e.g. aluminium used as blowing agent

Definition statement

This place covers:

Metals used as active ingredient for mortars, concrete or artificial stone

C04B 22/06

Oxides, Hydroxides (C04B 22/0013 takes precedence)

Definition statement

This place covers:

oxides, hydrocides used as active ingredients for mortars, concrete or artificial stone,

e.g. gelatinous $Al(OH)_3$

References

Limiting references

This place does not cover:

SiO_2	C04B 14/062
Al_2O_3, $Al(OH)_3$	C04B 14/303;
Takes precedence	C04B 22/0013
CO_2	C04B 22/10

C04B 22/062

{of the alkali or alkaline-earth metals}

Definition statement

This place covers:

oxides, hydroxides of the alkali or alkaline-earth metals used as active ingredients for mortars, concrete or artificial stone

e.g. NH_4OH;

e.g. NATRON LYE = AQUEOUS SOLUTION of NaOH;

e.g. HYDROXYLAMINE = NH2OH;

e.g. (POTASH) LYE= aqueous solution of KOH;

e.g. NaOH with Soda impurities;

e.g. KOH

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

"LESSIVE DE SOUDE" = " NATRONLOOG" = NATRON LYE = AQUEOUS SOLUTION of NaOH;

(POTASH) LYE = "LAUGE" = aqueous solution of KOH

"SODASTEIN" = "SEIFENSTEIN" = NaOH with Soda impurities;

"POTASCHE" = "POTASSE" = KOH

C04B 22/068

{Peroxides, e.g. hydrogen peroxide}

Definition statement

This place covers:

Peroxides used as active ingredients for mortars, concrete or artificial stone

e.g. H2O2

C04B 22/08

Acids or salts thereof {(C04B 22/0013 takes precedence)}

Definition statement

This place covers:

Acids or salts of inorganic materials used as active ingredients for mortars, concrete or artificial stone

e.g. MOLYBDATES;

e.g. PERMANGANATES

References

Limiting references

This place does not cover:

Boron compounds used as active ingredients for mortars, concrete or artificial stone	C04B 22/0013

C04B 22/10

containing carbon in the anion

Definition statement

This place covers:

Acids or salts of inorganic materials containing carbon in the anion, used as active ingredients for mortars, concrete or artificial stone,

e.g. SALMIAC = (NH4)2CO3

e.g. SODA = SODA ASH = Na2CO3;

e.g. K4(Fe((CN)6).3H2O yellow, K3(Fe(CN)6) red;

e.g. CYANATES, KCN;

e.g. also CO2

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

SALMIAC = (NH4)2CO3 = "GEISTERSALTZ" = "HIRSCHHORNSALZ";

SODA = SODA ASH = "SOUDE"

"BLUTLAUGENSALZ" = K4(Fe((CN)6).3H2O yellow, K3(Fe(CN)6) red;

C04B 22/12

containing halogen in the anion

Definition statement

This place covers:

Acids or salts of inorganic materials containing halogen in the anion used as active ingredients for mortars, concrete or artificial stone

e.g. BLEACHING POWDER = CaCl(OCl).CaO.H2O;

e.g. Hg chloride;

e.g. MURIATIC ACID = HCl

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

BLEACHING POWDER = "CHLORKALK"

"SUBLIM CORROSIF" = Hg chloride

C04B 22/124

{Chlorides of ammonium or of the alkali or alkaline earth metals, e.g. calcium chloride}

Definition statement

This place covers:

Chlorides of ammonium or of alkali or alkaline earth metals used as active ingredients for mortars, concrete or artificial stone,

e.g. NH4Cl = muriate of ammonia

C04B 22/126

{Fluorine compounds, e.g. silico-fluorine compounds}

Definition statement

This place covers:

Fluorine compounds of inorganic materials used as active ingredients for mortars, concrete or artificial stone,

e.g. SILICOFLUORIDES;

e.g. FLUOROSILICATES

C04B 22/14

containing sulfur in the anion, e.g. sulfides

Definition statement

This place covers:

Acids or salts thereof of inorganic materials containing sulfur in the anion used as active ingredients for mortars, concrete or artificial stone,

e.g. SULFAMIMIC ACID = NH2SO3H;

e.g. Na-THIOSULFATE = Na2S2O3 x 5 H2O;

e.g. Ca-THIOCYANATE

C04B 22/142

{Sulfates}

Definition statement

This place covers:

Sulfates of inorganic materials used as active ingredients for mortars, concrete or artificial stone,

e.g. EPSOM SALT = MgSO4;

e.g. KFe(SO4)2 x 12H2O;

e.g. mixtures or alternatives of sulfates (covered by several C04B 22/142 subgroups)

References

Limiting references

This place does not cover:

Jarosite	C04B 22/14
Bisulfates, hydroxysulfates, e. g. KHSO4,	C04B 22/14
Alums	C04B 22/148

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

"BITTERSALZ" = EPSOM SALT

"EISENALAUNE" = Doppelsalze des Eisen(III)-sulfats nach Art derAlaune, e.g. "KALIUMEISENALAUN" (KFe(SO4)2 x 12H2O);

C04B 22/147

{Alkali-metal sulfates; Ammonium sulfate}

Definition statement

This place covers:

Alkali-metal sulfates, ammonium sulfate of inorganic materials used as active ingredients for mortars, concrete or artificial stone

e.g. GLAUBERITE

References

Limiting references

This place does not cover:

Other ´alums´, i.e. other than Al-alums	C04B 22/142
Alums or alunite, calcined or not	C04B 22/148

C04B 22/148

{Aluminium-sulfate}

Definition statement

This place covers:

Aluminium-sulfate of inorganic materials used as active ingredients for mortars, concrete or artificial stone

e.g. (calcined) ALUNITE;

e.g. ALUMS

C04B 22/16

containing phosphorus in the anion, e.g. phosphates

Definition statement

This place covers:

Acids or salts thereof of inorganic materials containing phosphorous in the anion,

e.g. MICROCOSMIC SALT = Na(NH4)HPO4.4H2O

C04B 24/00

Use of organic materials as active ingredients for mortars, concrete or artificial stone, e.g. plasticisers

Definition statement

This place covers:

Organic materials used as active ingredients for mortars, concrete or artificial stone,

e.g. LIGROIN (benzine);

e.g. RUTIN;

e.g. WHITE SPIRIT = mainly heptane, octane;

e.g. impure NAPHTALENE e.g. esters of inorganic acids, ethylene carbonate;

e.g. PERFUME;

e.g. YEAST

e.g. norbornene and its derivatives (e.g. as modifiers for sulfur cements)

e.g. (di) cyclopentadiene (e.g. as modifiers for sulfur cements)

Special rules of classification

Organic active ingredients as components of a cementitious mixture are indexed in the C-set of the CIS database using entries from C04B 24/00. Classification in C04B 24/00 and subgroups is done when these ingredients are (or suspected to be) new or unusual or special details describing such an ingredient are given.

C04B 24/001

{Waste organic materials}

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Vinasse	residual liquid from the distillation of liquid alcohol;
Fusel oil	mixture of alcohols, fatty acids and esters obtained during distillation of fermentation alcohol

C04B 24/003

{Phosphorus-containing compounds}

References

Limiting references

This place does not cover:

Phosphorus containing polymers	C04B 24/243

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

PHOSPHONOCARBOXYLIC ACID	H2O3P-R-COOH
PHOSPHONIC ACID	RPO3H2
PHOSPHINIC ACID	R2PO2H
PHOSPHORIC ESTER	(HO)2PO-OR
PHYTIC ACID = PHYTINIC ACID = meso-inositol hexaphosphoric acid	C6H6(OPO(OH2))6

C04B 24/005

{Halogen-containing compounds}

Definition statement

This place covers:

all halogenated compounds except chlorosilanes

References

Limiting references

This place does not cover:

Pesticides	C04B 24/00
Halogenated polymers of the type corresponding to groups C04B 24/28-C04B 24/383	receive two classes, one in C04B 24/005 and one in the polymer group
Halogen containing polymers obtained by reactions only involving carbon to carbon unsaturated bonds	C04B 24/2682
Chlorosilanes	C04B 24/42

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

PERFLUOR compounds	CnF2n-1 (all H exchanged for F)
PENTA CHLORO PHENOLATE = PENTA CHLORO PHENATE	C6Cl5ONa

C04B 24/008

{Aldehydes, ketones}

Definition statement

This place covers:

Aldehydes, ketones used as active ingredients for mortars, concrete or artificial stone,

e.g. GLYOXAL OHCCHO;

e.g. FURFURAL;

e.g. FORMALIN (40% aq. sln of formaldehyde);

e.g. ACETYL ACETONE CH3COCH2COCH3;

e.g. DIOXAN

References

Limiting references

This place does not cover:

Paraformaldehyde	C04B 24/023

C04B 24/02

Alcohols; Phenols; Ethers

Definition statement

This place covers:

All Alcohols, phenols, ethers used as active ingredients for mortars, concrete or artificial stone,

e.g. ALCOHOL;

e.g. PHENOL;

e.g. POLYHYDRIC ALCOHOLS i.e. DIOLS: GLYCOL, TRIOLS: GLYCEROL =GLYCERINE = 1,2,3-PROPANETRIOL, ETHYLENE GLYCOL (HOCH2CH2OH),TRIMETHYLENE GLYCOL = 1,3-PROPANEDIOL (HO(CH2)3OH);

e.g. "KRESOL" CRESOL = CH3C6H4OH, o-, m-, p-;

e.g. ETHYLALCOHOL = SPIRITUS;

e.g. SORBIT = SORBITOL C6H14O6 (6 OH groups), SORBITAN =MONOANHYDROSORBIT C6H4O(OH)4;

e.g. FUCUSOL = FUCOSOL = furfurol + methylfurfurol;

e.g. 2,3-DIHYDROXY-1,4-DIOXAN = glyoxal trimer;

e.g. CATECHOL = 1,2-C6H4(OH)2;

e.g. RESORCINOL = 1,3-C6H4(OH)2;

e.g. HYDROQUINONE = 1,4-C6H4(OH)2;

e.g. PHLOROGLUCINOL = 1,3,5-C6H3(OH)3;

e.g. PYROGALLOL = 1,2,3-trihydroxybenzene;

e.g. NAPHTHOL;

e.g. PENTAERYTHRITOL;

e.g. ALKOXIDE = ALCOOLATE i.e. Al(OC2H5)3;

e.g. EUGENOL;

e.g. TERPINEOL, TERPINENOL

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

PHENOL = "CARBOLSAEURE"

RESORCINOL = "RESORZIN"

C04B 24/023

{Ethers}

Definition statement

This place covers:

All ethers used as active ingredients for mortars, concrete or artificial stone,

e.g. ETHER R-O-R´;

e.g. DIETHYLENE GLYCOL HOCH2CH2OCH2CH2OH;

e.g. TRIOXYMETHYLENE = TRIOXANE (CH2O)3 = PARAFORMALDEHYDE;

e.g. epoxide

References

Limiting references

This place does not cover:

Glycidylether: appears as terminal group of epoxy resin structures	C04B 24/281

C04B 24/026

{Fatty alcohols}

Definition statement

This place covers:

All fatty alcohols used as active ingredients for mortars, concrete or artificial stone

e.g. ethoxylated fatty alcohols

C04B 24/04

Carboxylic acids; Salts, anhydrides or esters thereof

Definition statement

This place covers:

Carboxylic acids, Salts, anhydrides thereof used as active ingredients for mortars, concrete or artificial stone

e.g. CARBOXYLIC ACIDS R-COOH (carboxy-, -oic acid);

e.g. CARBOXYLIC ACID SALTS R-COOM (M carboxylate, -oate);

e.g. ANHYDRIDES;

e.g. GLYOXYLIC ACID HOOCHO;

e.g. BENZOIC ACID, BENZOATES;

e.g. AGATHIC ACID;

e.g. NAPHTHENIC ACID, NAPHTHENATES;

e.g. RESIN ACID, RESINATES e.g. complex mixture of monocarboxylic acids derived from pine tree extrudate, tree stumps, or tall oil manufacturing. Major components : ABIETIC ACID (=SYLVIC ACID)and PIMARIC ACID;

e.g. KETOCARBOXYLIC ACIDS HO2CCH2CH2COCOOH= a-ketoglutaric acid;

e.g. COAL ACIDS;

e.g. ERYTHORBIC ACID, ERYTHORBATES;

e.g. RESIN SOAPS, SAPONIFIED RESINS

References

Limiting references

This place does not cover:

ROSIN = mainly resin acids	C04B 24/34

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

"HARZSEIFEN"=RESIN SOAPS, SAPONIFIED RESINS

C04B 24/045

{Esters, e.g. lactones}

Definition statement

This place covers:

Esters of carboxylic acids used as active ingredients for mortars, concrete or artificial stone,

e.g. organic carbonates e.g. ETHYLENE CARBONATE;

e.g. ESTERS R-COOR´ (R-carboxylate, R- oxycarbonyl, R-oate);

e.g. GLYCERIDES = glycerine esters;

e.g. ACETINS = acetates (ethanoates) of glycerol, MONOACETIN,DIACETIN,TRIACETIN;

e.g. ETHYLENE GLYCOL DIACETATE = ethylidene diacetate = acetaldehydediacetate H3CCO-O-C2H4-O-OCCH3;

e.g. LACTONES = cyclic esters;

e.g. CAPROLACTONE

C04B 24/06

containing hydroxy groups

Definition statement

This place covers:

Carboxylic acids, salts, anhydrides containing hydroxy groups, used as active ingredients for mortars, concreter or artificial stone

e.g. OXYCARBOXYLIC ACIDS;

e.g. LACTIC ACID CH3-CH(OH)-COOH;

e.g. CREAM OF TARTAR = potassium hydrogen tartrate C4H5O6K;

e.g. Na a- and b- GLUCOHEPTONATE;

e.g. CITRIC ACID;

e.g. GLUCONIC ACID;

e.g. GALLIC ACID;

e.g. ALDONIC ACID;

e.g. SACCHARIC ACID = TETRAHYDROXYADIPIC ACID;

e.g. CRESYLIC ACID;

e.g. FLUORESCEIN = RESORCINOLPHTHALEIN = URANINE (Na salt) =DIOXYLFLUORANE C20H12O5;

e.g. BILE ACID (cholic acid)

C04B 24/08

Fats; Fatty oils; Ester type waxes; Higher fatty acids, i.e. having at least seven carbon atoms in an unbroken chain bound to a carboxyl group; Oxidised oils or fats

Definition statement

This place covers:

Fats, fatty oils, ester type waxes, oxidised oils or fats used as active ingredients for mortars, concrete or artificial stone,

e.g. FATS = esters of long chain fatty acids and glycerol;

e.g. FATTY OILS = idem e.g. SOJA OIL, OLIVE OIL,RICINUS OIL = CASTOROIL,LINSEED OIL, PALM OIL;

e.g. ESTER TYPE WAXES = "CIRE" = monoesters of long chain unbranched fatty acids and alcohols e.g. MONTAN WAX, CHIN-SAP WAX, SPERMACETI WAX=WALRAT;

e.g. LIPIDES = esters of long chain carboxylic acids e.g. FATS;

e.g. RAPESEED OIL (COLZA OIL);

e.g. CHINA WOOD OIL;

e.g. ETHOXYLATED FATTY ACID

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

"RUEBOEL" = RAPESEED OIL ("REPSOEL", "RAPSOEOL","RUEBSENOEL", "RUEBOEL", COLZA OIL);

e.g. "HOLZOEL" = "TUNGOEL" = CHINA WOOD OIL

C04B 24/085

{Higher fatty acids}

Definition statement

This place covers:

Higher fatty acids, i.e. having at least seven carbon atoms in an unbroken chain bound to a carboxyl group used as active ingredients for mortars, concrete or artificial stone,

e.g. SOAPS = salts of higher fatty acids;

e.g. UNSATURATED HIGHER FATTY ACIDS : PALMITOLEIC, OLEIC, RICINOLEIC,LIONLEIC, LINOLENIC, ELEOSTEARIC;

e.g. SATURATED HIGHER FATTY ACIDS: CAPROIC, CAPRYLIC, CAPRIC, LAURIC,MYRISTIC, PALMITIC, STEARIC, ARACHIDIC, BEHEMIC, LIGNOCERIC, CEROTIC;

e.g. OLEIN;

e.g. OLEIC ACID

References

Limiting references

This place does not cover:

Rosin (= mainly resin acids)	C04B 24/34

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

OLEIC ACID = "ÖLSAÜRE" = "OLIENSAÜRE" = "OCTADECENSAÜRE"= "ACIDUMOLEINICUM"

C04B 24/10

Carbohydrates or derivatives thereof

Definition statement

This place covers:

Carbohydrates or derivatives thereof used as active ingredients for mortars, concrete or artificial stone

e.g. historically Cx(H2O)y = polyhydroxylated compounds;

e.g. OLIGOSACCHARIDES : DISACCHARIDES, TRISACCHARIDES, TETRASACCHARIDES;

e.g. MOLASSE, MELASSE, SUCROSE;

e.g. MANNITOL= MANNITE;

e.g. WHEY (lactose is the most important ingredient after water);

e.g. SKIMMED MILK;

e.g. SAPONIN = plant glycosides, forming soapy lathers on shaking with water;

e.g. GLYCOSIDES (GLUCOSIDES) , hydrolyse into sugars and other organic substances;

e.g. LEVULOSE = d-FRUCTOSE= FRUIT SUGAR, DIABETIN, LEVOGLUCOSE,SUCROLEVULOSE;

e.g. ALDOSE, KETOSE

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

MANNITOL= MANNITE= "MANNAZUCKER";

MANNITOL= MANNITE;

e.g. WHEY = "MOLKE" = "WEI" = "BOTERMELK"

C04B 24/12

Nitrogen containing compounds {organic derivatives of hydrazine (hydrazine C04B 22/00)}

Definition statement

This place covers:

Nitrogen containing compounds used as active ingredients for mortars, concrete or artificial stone

e.g. PENAZOLINE e.g. CA93:136836, CA92:63547, CA93:172622, CA90:141458;

e.g. CHLOROPHYLL;

e.g. AMINE OXIDE R1-R2-R3-N=O

References

Limiting references

This place does not cover:

Hydrazine	C04B 22/00

C04B 24/121

{Amines, polyamines}

Definition statement

This place covers:

Amines, polyamines used as active ingredients for mortars, concrete or artificial stone

e.g. and derivatives e.g. salts;

e.g. TM UROTROPINE = HEXAMETHYLENE TETRAMINE;

e.g. ANILINE C6H5-NH2 = PHENYLAMINE = AMINOBENZENE;

e.g. FATTY AMINES

C04B 24/122

{Hydroxy amines}

Definition statement

This place covers:

Hydroxy amines and derivatives, e.g. salts used as active ingredients for mortars, concrete or artificial stone;

e.g. NH2 + OH;

e.g. ETHANOLAMINES: MONOETHANOLAMINE, DIETHANOLAMINE, TRIETHANOLAMINE;

e.g. ADRENALINE

C04B 24/123

{Amino-carboxylic acids}

Definition statement

This place covers:

Amino-carboxylic acids and derivatives used as active ingredients for mortars, concrete or artificial stone

e.g. NH2 + COOH;

e.g. NITRILOTRIACETIC ACID N(CH2COOH)3;

e.g. GLUTAMIC ACID = a-AMINOGLUTARIC ACID = 2-AMINOPENTANEDIOIC ACID =amino acid derived from hydrolysis of vegetable protein;

e.g. GLYCINE = AMINOACETIC ACID H2N-CH2-COOH;

e.g. EDTA = ETHYLENEDIAMINETETRAACETIC ACID

e.g. betaine

C04B 24/124

{Amides}

Definition statement

This place covers:

Amides, acid amides and derivatives used as active ingredients for mortars, concrete or artificial stone

e.g. e.g. RCONH2, (RCO)2NH, (RCO)3N;

e.g. FATTY AMIDES e.g. COCOAMIDE

References

Limiting references

This place does not cover:

Carbamide = urea	C04B 24/126
Isocyanuric acid	C04B 24/128
Lactams = cyclic amides, caprolactam	C04B 24/128;
Glycylglycine = diglycine = dipeptide H2N-CH2-CO-NH-CH2-COOH	C04B 24/14

C04B 24/125

{Compounds containing one or more carbon-to-nitrogen double or triple bonds, e.g. imines}

Definition statement

This place covers:

Compounds containing one or more carbon-to nitrogen double or triple bonds and derivatives used as active ingredients for mortars, concrete or artificial stone

e.g. CYANATES R-N=C=O;

e.g. CYANAMIDE NH2CN;

e.g. DICYANDIAMIDE H2N-CNH-NH-CN;

e.g. NITRILES RCN;

e.g. IMINES R-CH=NH

C04B 24/126

{Urea}

Definition statement

This place covers:

Urea and derivatives used as active ingredients for mortars, concrete or artificial stone

e.g. = CARBAMIDE NH2-CO-NH2;

e.g. THIOUREA = THIOCARBAMIDE NH2-SC-NH2

References

Limiting references

This place does not cover:

N,N-dimethyloldihydroxyethylene urea	C04B 24/128

C04B 24/128

{Heterocyclic nitrogen compounds}

Definition statement

This place covers:

All heterocyclic nitrogen compounds , even if they fall under one of the categories covered by the previous subgroups used as active ingredients for mortars, concrete or artificial stone

e.g. LACTAMS = cyclic amides , CAPROLACTAM;

e.g. CYANURATES, ISOCYANURIC ACID;

e.g. HYDANTOIN = GLYCOLYLUREA = GLYCOLUSIL;

e.g. IMIDAZOLE

e.g. DINITROPENTAMETHYLENE TETRAMINE

C04B 24/14

Peptides; Proteins; Derivatives thereof

Definition statement

This place covers:

PEPTIDES (much smaller number of amino units per molecule than proteins); ENZYMES;

PROTEINS (polymers of a-amino acids) and derivatives thereof used as active ingredients for mortars, concrete or artificial stone

e.g. GELATIN, COLLAGEN, KERATIN;

e.g. CASEIN,

e.g. BLOOD, HEMOGLOBINE;

e.g. GLUTEN;

e.g. ZEIN = corn protein

e.g. BLACK GRAM = polysaccharide-protein

e.g. PROTALBINIC ACID, LYSALBINIC ACID;

e.g. soluble proteins: ALBUMINS, GLOBULINS, GLUTELINS, HISTONES,PROTAMINES;

e.g. GLYCYLGLYCINE = dipeptide

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

CASEIN,=COLLE D´OS

"KOELNER LEIM

C04B 24/16

Sulfur-containing compounds

Definition statement

This place covers:

Sulfur-containing compounds used as active ingredients for mortars, concrete or artificial stone,

e.g. SULfONIC COMPOUNDS = -SO3H, sulfonated;

e.g. SULFURIC COMPOUNDS = -OSO3H, sulfated;

e.g. BUNTE SALTS = water soluble organic thiosulphate compounds;

e.g. TURKEY RED OIL = SULFORICINATE;

e.g. ISOPROPYL THIOCYANATE (CH3)2CHSCN

References

Limiting references

This place does not cover:

Sulfonated polystyrene	C04B 24/22
Sulfonated ketone resins	C04B 24/30

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

TURKEY RED OIL = SULFORICINATE = "TURKISCH ROTÖL"

C04B 24/18

Lignin sulfonic acid or derivatives thereof, e.g. sulfite lye

Definition statement

This place covers:

Lignin sulfonic acid or derivatives thereof used as active ingredients for mortars, concrete or artificial stone,

e.g. LIGNIN SULFONIC ACID = substituted phenylpropane R-CH(SO3H)-CH(OH)-R

e.g. modified lignosulfonate

C04B 24/20

Sulfonated aromatic compounds

Definition statement

This place covers:

Sulfonated aromatic compounds used as active ingredients for mortars, concrete or artificial stone

e.g. SULFANOL;

e.g. FOKS = fuel oil cracking sulfonated = salt of sulfonated andoxidised product resulting from the reaction of SO3 with fuel oils from steam cracking of oil products

C04B 24/22

Condensation {or polymerisation} products thereof

Definition statement

This place covers:

Condensation or polymerisation products thereof of sulfonated aromatic compounds used as active ingredients for mortars, concrete or artificial stone

Condensation or polymerisation products containing aromatic nucleus;

e.g. sulphonated polystyrene;

e.g. sulphonated amino-s-triazine

C04B 24/223

{Sulfonated melamine-formaldehyde condensation products}

Definition statement

This place covers:

Sulfonated melamine-formaldehyde condensation products used as active ingredients for mortars, concrete or artificial stone,

e.g. sulphonated melamine resins;

e.g. triazine-HCHO condensation product

C04B 24/24

Macromolecular compounds (C04B 24/14 takes precedence; macromolecular compounds comprising sulfonate or sulfate groups C04B 24/16)

Definition statement

This place covers:

Macromolecular compounds used as active ingredients for mortars, concrete or artificial stone,

e.g. LIGNIN;

e.g. HUMIC ACID;

e.g. LIGNATE

References

Limiting references

This place does not cover:

Peptides, proteins, derivatives thereof	C04B 24/14
Sulfur-containing compounds	C04B 24/16

Informative references

Attention is drawn to the following places, which may be of interest for search:

petroleum resins	C04B 24/26 (C04B 24/24 still to be cleaned)

C04B 24/26

obtained by reactions only involving carbon-to-carbon unsaturated bonds {(C04B 24/243 takes precedence)}

Definition statement

This place covers:

Macromolecular compounds obtained by reactions only involving carbon-to-carbon unsaturated bonds and used as active ingredients for mortars, concrete or artificial stone,

e.g. PETROLEUM RESIN (C4/C6 alkene fraction, C8/C10 aromatic fraction or dicyclopentadiene fraction);

e.g. VERSATATES;

e.g. LATEX RESIN;

e.g. COUMARONE RESIN = CUMAR RESIN or GUM = PARACOUMARONE RESIN =BENZOFURAN = synthetic rein from coal tar destillates;

e.g. DIALLYL POLYMERS

Relationships with other classification places

Resins as such equivalent to those are classified in C08F

References

Limiting references

This place does not cover:

Phosphorous-containing polymers used as active ingredients for mortars, concrete or artificial stone,	C04B 24/243

C04B 24/2611

{Polyalkenes}

Definition statement

This place covers:

Polyalkenes obtained by reactions only involving carbon-to-carbon unsaturated bonds and used as active ingredients for mortars, concrete or artificial stone,

e.g. POLYTERPENES i.e. NATURAL RUBBER

C04B 24/2617

{Coumarone polymers}

Definition statement

This place covers:

Coumarone polymers used as active ingredients for mortars, concrete or artificial stone, e.g. INDENE-CUMARONE RESIN

C04B 24/2623

{Polyvinylalcohols; Polyvinylacetates}

Definition statement

This place covers:

Polyvinylalcohols, polyvinylacetates obtained by reactions only involving carbon-to-carbon unsaturated bonds and used as active ingredients for mortars, concrete or artificial stone,

e.g. ETHYLENE VINYLACETATE;

e.g. VINYLLAURATE-VINYLACETATE;

e.g. POLYVINYL PROPIONATE

C04B 24/2641

{Polyacrylates; Polymethacrylates}

Definition statement

This place covers:

Polyacrylates, polymethyacrylates obtained by reactions only involving carbon-to-carbon unsaturated bonds and used as active ingredients for mortars, concrete or artificial stone,

e.g. COPOLYMERS of POLY(METH)ACRYLATES with other VINYL MONOMERS (e.g. styrene, vinylacetate);

e.g. mixture of acrylic monomers

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

copolymers having three different monomers	C04B 24/2688

C04B 24/2652

{Nitrogen containing polymers, e.g. polyacrylamides, polyacrylonitriles}

Definition statement

This place covers:

Nitrogen containing polymers obtained by reactions only involving carbon-to-carbon unsaturated bonds and used as active ingredients for mortars, concrete or artificial stone

e.g. ACRYLNITRIL-STYROL COPOLYMER;

e.g. ACRYLNITRIL-BUTADIENE COPOLYMER;

e.g. Polyvinylamide

C04B 24/2664

{of ethylenically unsaturated dicarboxylic acid polymers, e.g. maleic anhydride copolymers}

Definition statement

This place covers:

Macromolecular compounds obtained by reactions only involving carbon-to-carbon unsaturated bonds of ethylenically unsaturated dicarboxylic acid polymers and used as active ingredients for mortars, concrete or artificial stone

e.g. STYROL-MALEIC ACID COPOLYMER;

e.g. VINYLACETATE-MALEIC ACID COPOLYMER;

e.g. ISOBUTYLENE-MALEIC ACID COPOLYMER;

e.g. POLYALKYLENE SUCCENIC ANHYDRIDE;

e.g. VINYL ACETATE-DIBUTYL MALEATE COPOLYMER

C04B 24/2676

{Polystyrenes}

Definition statement

This place covers:

Polystyrenes compounds obtained by reactions only involving carbon-to-carbon unsaturated bonds and used as active ingredients for mortars, concrete or artificial stone

e.g. STYRENE-BUTADIENE;

e.g. STYRENE-BUTADIENE-PVA

References

Limiting references

This place does not cover:

Styrene-acryl copolymers	C04B 24/2641
Styrene-maleic anhydride copolymers	C04B 24/2664;

Special rules of classification

C04B 24/2641 takes precedence.

C04B 24/2682

{Halogen containing polymers, e.g. PVC}

Definition statement

This place covers:

Halogen containing polymers obtained by reactions only involving carbon-to-carbon unsaturated bonds and used as active ingredients for mortars, concrete or artificial stone

e.g. PTFE (RN 9002-84-0);

e.g. CHLOROPRENE

C04B 24/2688

{Copolymers containing at least three different monomers}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Polyacrylates	C04B 24/2641

Special rules of classification

C04B 24/2682 takes precedence

C04B 24/28

obtained otherwise than by reactions only involving carbon-to-carbon unsaturated bonds {(C04B 24/243 takes precedence)}

Definition statement

This place covers:

Macromolecular compounds obtained otherwise than by reactions only involving carbon-to-carbon unsaturated bonds and used as active ingredients for mortars, concrete or artificial stone

e.g. POLYETHYLENE TEREPHTHTALATE;

e.g. POLYIMIDES; POLYESTER IMIDE; POLYAMIDIMINE;

e.g. POLYTHIOCARBONATE;

e.g. POLYSULFONES; POLYSULPHONAMIDE;

e.g. POLYTHIOETHER;

e.g. POLYSULPHIDE;

e.g.. ETHOXYLINE RESIN;

e.g. FURAN RESIN (deriv. from furfuryl alcohol);

e.g. POLYALKYLENE POLYAMINES;

e.g. POLYAMINES; POLYESTERAMIDES

e.g. POLYETHYLENE IMINE (CH2CH2NH)x

Relationships with other classification places

resins as such equivalent to those classified in C08G

References

Limiting references

This place does not cover:

Phosphorous-containing polymers used as active ingredients for mortars, concrete or artificial stone,	C04B 24/243

C04B 24/281

{Polyepoxides}

Definition statement

This place covers:

Polyepoxides compounds obtained otherwise than by reactions only involving carbon-to-carbon unsaturated bonds and used as active ingredients for mortars, concrete or artificial stone

e.g. a-EPICHLORHYDRINE-1 CHLORO 2,3 EPOXY PROPANE

C04B 24/283

{Polyesters}

Definition statement

This place covers:

Polyesters compounds obtained otherwise than by reactions only involving carbon-to-carbon unsaturated bonds and used as active ingredients for mortars, concrete or artificial stone

e.g. ALKYD resins;

e.g. polylactic acid, polylactide

C04B 24/302

{Phenol-formaldehyde condensation polymers}

Definition statement

This place covers:

The use for instance of phenol resin as binder, novolac resin, resol resin.

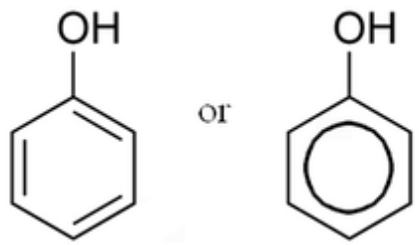
Phenol-formaldehyde resins, as a group, are formed by a step-growth polymerization reaction that can be either acid- or base-catalysed. Since formaldehyde exists predominantly in solution as a dynamic equilibrium of methylene glycol oligomers, the concentration of the reactive form of formaldehyde depends on temperature and pH.

Phenol is reactive towards formaldehyde at the ortho and para sites (sites 2, 4 and 6) allowing up to 3 units of formaldehyde to attach to the ring. The initial reaction in all cases involves the formation of a hydroxymethyl phenol:

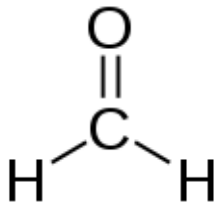
$HOC_6H_5 + CH_2O \rightarrow HOC_6H_4CH_2OH$

Novolacs (originally Novolak, the name given by Leo Baekeland), are phenol-formaldehyde resins made where the molar ratio of formaldehyde to phenol of less than one. The polymerization is brought to completion using acid-catalysis. The phenol units are mainly linked by methylene groups

Base-catalysed phenol-formaldehyde resins are made with a formaldehyde to phenol ratio of greater than one (usually around 1.5). These resins are called resols. Phenol, formaldehyde, water and catalyst are mixed in the desired amount, depending on the resin to be formed, and are then heated



Phenol - the simplest of the phenols



Formaldehyde

References

Limiting references

This place does not cover:

Using phenol resin for joining ceramic with ceramic	C04B 37/008
Using phenol resin for joining ceramic with metal	C04B 37/028
Using phenol resin for joining ceramic with glass	C04B 37/047
The use of phenol-formaldehyde condensation products in coatings of ceramic substrates	C04B 41/4823

Informative references

Attention is drawn to the following places, which may be of interest for search:

Condensation polymers of aldehydes or ketones added as active ingredient to cement, concrete, mortar or artificial stone: phenol-formaldehyde condensation polymers	C04B 24/302, C04B 26/122
Binders for refractory mould or core materials based on resins or rosins obtained otherwise than by reactions only involving carbon-to-carbon unsaturated bonds: condensation polymers of aldehydes and ketones: with phenols	B22C 1/2253

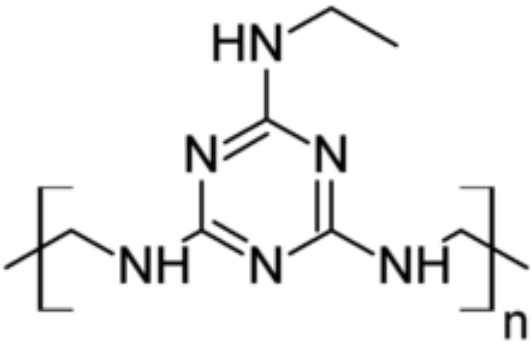
C04B 24/305

{Melamine-formaldehyde condensation polymers}

Definition statement

This place covers:

Melamine resin or melamine formaldehyde (also shortened to melamine) is a hard, thermosetting plastic material made from melamine and formaldehyde by polymerization.



References

Limiting references

This place does not cover:

The use of condensation polymers of aldehydes or ketones in coatings of ceramic substrates: melamine-formaldehyde condensation products	C04B 41/4815

Informative references

Attention is drawn to the following places, which may be of interest for search:

Condensation polymers of aldehydes or ketones added as active ingredient to cement, concrete, mortar or artificial stone: melamine-formaldehyde condensation polymers	C04B 24/305, C04B 26/125

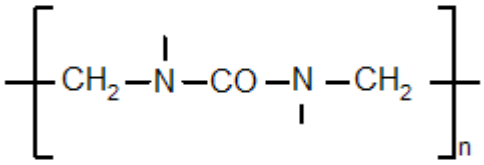
C04B 24/307

{Urea-formaldehyde condensation polymers}

Definition statement

This place covers:

Urea-formaldehyde, also known as urea-methanal, named so for its common synthesis pathway and overall structure, [1] is a non-transparent thermosetting resin or plastic, made from urea and formaldehyde heated in the presence of a mild base such as ammonia or pyridine



References

Limiting references

This place does not cover:

The use of condensation polymers of aldehydes or ketones in coatings of ceramic substrates: urea-formaldehyde condensation products	C04B 41/4819

Informative references

Attention is drawn to the following places, which may be of interest for search:

Condensation polymers of aldehydes or ketones added as active ingredient to cement, concrete, mortar or artificial stone: urea-formaldehyde condensation polymers	C04B 24/307, C04B 26/127

C04B 24/32

Polyethers, e.g. alkylphenol polyglycolether

Definition statement

This place covers:

Polyethers compounds obtained otherwise than by reactions only involving carbon-to-carbon unsaturated bonds and used as active ingredients for mortars, concrete or artificial stone

also polyethylene glycol esters

e.g. POLYETHYLENE OXIDE;

e.g. POLYETHYLENEPOLYAMINE, POLYETHYLENE IMINE;

e.g. POLYETHYLENE GLYCOL,

e.g. POLYACETAL GLYCOL;

e.g. ALKYLPHENOLPOLYGLYCOL ETHER;

e.g. PARAFORMALDEHYDE;

e.g. ALKYLAMINO POLY(OXYMETHYLENE)GLYCOL

C04B 24/34

Natural resins, e.g. rosin {(C04B 24/243 takes precedence)}

Definition statement

This place covers:

Natural resin used as active ingredients for mortars, concrete or artificial stone

e.g. natural (animal, vegetable) waxes: CANDELLILA WAX, CARNAUBA WAX,KANNUTILLA WAX;

e.g. TURPENTINE OIL (PINENES);

e.g. COLOPHONIUM = COLOPHANE;

e.g. CREOSOTE;

e.g. ROSIN is obtained from various species of pine = ABIETIC ACID;

e.g. SHELLAC

e.g. LACQUER = shellac dissolved in alcohol, coloured with saffron or dragon´s blood;

e.g. EUCALIPTUS OIL; TALL OIL;

e.g. GUTTA-PERCHA;

e.g. v g tale;

e.g. VINSOL

References

Limiting references

This place does not cover:

Phosphorous-containing polymers used as active ingredients for mortars, concrete or artificial stone,	C04B 24/243
Polysaccharides	C04B 24/38

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

CREOSOTE ="HOLZTEER"

SHELLAC = "SCHELLACK" = "SCHOLLENLACK" = "BLATTLACK" = "GUMMILACK"= "LACCA IN TABULIS";

"MUCILAGE";

"GOUDRON"

C04B 24/36

Bituminous materials, e.g. tar, pitch {(C04B 24/243 takes precedence)}

Definition statement

This place covers:

Bituminous materials used as active ingredients for mortars, concrete or artificial stone

e.g. ASPHALT, ASPHALTITE;

e.g. KEROSINE, PARAFFIN;

e.g. "PARAFFIN OIL, VASELINE OIL;

e.g. CARBOLINEUM;

e.g. PETROLATUM;

e.g. mineral, paraffin waxes

References

Limiting references

This place does not cover:

Phosphorous-containing polymers used as active ingredients for mortars, concrete or artificial stone,	C04B 24/243

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

ASPHALT= "KOOLTEER"= ASPHALTITE;

PARAFINE= PARAFFIN OIL

"CERESIN" = "ZERESIN" = "HART PARAFIN" = "GEREINIGTES ERDWACHS" ="CERA MINERALIS ALBA";

"BRAI de HOUILLE"

C04B 24/38

Polysaccharides or derivatives thereof {(C04B 24/243 takes precedence)}

Definition statement

This place covers:

Polysaccharides or derivatives thereof used as active ingredients for mortars, concrete or artificial stone

e.g. ARABIC GUM, GUM ACACIA;

e.g. GALACTO-MANNAN, GUAR GUM, GLUCO-MANNAN;

e.g. AGAR AGAR;

e.g. TANNIN = TANNIC ACID;

e.g. GUM GHATTI, LOCUST BEAN GUM = CAROB BEAN GUM;

e.g. CAROB FRUIT;

e.g. INULIN ;

e.g. WELAN GUM

e.g. FRENCH CEMENT = gum arabic + powdered starch;

e.g. ALGINATES, GLYCOGEN, PECTINE; CHITOSAN; DEXTRAN

e.g. XANTHOMANOS GUM = XANTHAN GUM;

e.g. SCLEROGLUCAN, CURDLAN, PULLULAN;

References

Limiting references

This place does not cover:

Phosphorous-containing polymers used as active ingredients for mortars, concrete or artificial stone,	C04B 24/243
Polyethers	C04B 24/32

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

"JOHANNESBROOD" = CAROB FRUIT

INULIN = "POLYVRUCHTENSUIKER"

C04B 24/383

{Cellulose or derivatives thereof}

Definition statement

This place covers:

Cellulose or derivatives thereof used as active ingredients for mortars, concrete or artificial stone

e.g. CELLULOSE; CARBOXY METHYL CELLULOSE CMC;

e.g. HYDROXY ETHYL CELLULOSE HEC;

e.g. METHYL HYDROXY ETHYL CELLULOSE MHEC;

e.g. DEXTRIN = starch derivative;

e.g. HEMICELLULOSE = KARAYA GUM = PENTASANE = GALACTON-GELOSE;

e.g. regenerated cellulose;

e.g. cellulose ethers;

e.g. VISCOSE; TRAGANTH

Synonyms and Keywords

In patent documents, the following abbreviations are often used

STAERKE"; DEXTRIN = starch derivative

C04B 24/405

{Organo-inorganic complexes}

Definition statement

This place covers:

Any organo-inorganic complexes used as active ingredients for mortars, concrete or artificial stone

e.g. metal carbonyls

C04B 24/42

Organo-silicon compounds

Definition statement

This place covers:

Organo-silicon compounds used as active ingredients for mortars, concrete or artificial stone

e.g. POLYSILANES -Si-Si-Si-Si-;

e.g. SILICONES -Si-O-Si-O-Si-

C04B 26/00

Compositions of mortars, concrete or artificial stone, containing only organic binders {, e.g. polymer or resin concrete (mechanical aspects of moulding polymer or resin concrete B29C 67/242)}

Definition statement

This place covers:

Organic or polymeric concretes or mortars i.e. compositions bearing an organic or polymeric binder.

This group covers organic or polymeric concrete compositions comprising at least 50% inorganic filler.

e.g. organic (e.g. polymer) P or B compounds as binder;

e.g. waterproof lacquer, benzol, acetone, aluminium powder and camphor e.g. LIGNIN derivatives;

e.g. MONTAN WAX

References

Limiting references

This place does not cover:

A combination of an organic and inorganic binder	C- set : (C04B 28/00; C04B 24/00)
Polymer modified concrete (PMC) or polymer concrete (PC) or polymer mortar (PM)	C-set: (C04B 28/00; C04B 24/00)
Mechanical aspects, moulding polymer or resin concrete	B29C 67/242

Informative references

Attention is drawn to the following places, which may be of interest for search:

Oil well cements containing organic binders	are classified in C04B 26/00 according to the composition and receive also a C09K 8/44 class
Organic or polymeric compositions with filler content less than 50%	C08J, C08K, C08L, C09D
Polyester compositions	C08L 67/00
Bituminous compositions	C08L 95/00

Grouting with organic compounds	**E02D20/02**

Special rules of classification

Classification is made according to the binder used, applying last place rule (LPR). Fillers and active ingredients are classified using the C-set symbols chosen from C04B 14/00, C04B 18/00, C04B 22/00 or C04B 24/00. If one of these ingredients is (or suspected to be) new or unusual or special details describing this ingredient are given, classification is also made for this ingredient.

When a list of possible organic binders is given, classification is made to the more general entry e.g. C04B 26/04 or C04B 26/10 or even C04B 26/02. If specific examples are given of one binder out of a list, a second more specific class relating to the exemplified binder is given.

C04B 26/003

{Oil-based binders, e.g. containing linseed oil}

Definition statement

This place covers:

Compositions of mortars, concrete or artificial stone containing oil-based binders

e.g. DRYING OILS, linseed oil

C04B 26/02

Macromolecular compounds

References

Limiting references

This place does not cover:

Attention P compounds	C04B 26/00
Lignin derivatives	C04B 26/00
Montan wax	C04B 26/00
Petroleum resins	C04B 26/04

C04B 26/026

{Proteins or derivatives thereof}

Definition statement

This place covers:

Compositions of mortars, concrete or artificial stone containing proteins or derivatives thereof

e.g. MILK

C04B 26/04

obtained by reactions only involving carbon-to-carbon unsaturated bonds

Definition statement

This place covers:

Compositions of mortars, concrete or artificial stone containing macromolecular compounds obtained by reactions only involving carbon-to-carbon unsaturated bonds

e.g. PETROLEUM RESINS

C04B 26/045

{Polyalkenes}

Definition statement

This place covers:

Compositions of mortars, concrete or artificial stone containing macromolecular compounds obtained by reactions only involving carbon-to-carbon unsaturated bonds being polyalkylenes

e.g. polybutadiene

C04B 26/06

Acrylates

Definition statement

This place covers:

Compositions of mortars, concrete or artificial stone containing macromolecular compounds obtained by reactions only involving carbon-to-carbon unsaturated bonds being acrylates

e.g. thermoplastic polymethylmethacrylate type polymer

C04B 26/10

obtained otherwise than by reactions only involving carbon-to-carbon unsaturated bonds

References

Limiting references

This place does not cover:

Grouting with organic components	E21D 20/02

C04B 26/122

{Phenol-formaldehyde condensation polymers}

Definition statement

This place covers:

Compositions of mortars, concrete or artificial stone containing phenol-formaldehyde condensation polymers

e.g. CRESOL -FORMALDEHYDE

C04B 26/14

Polyepoxides

Definition statement

This place covers:

Compositions of mortars, concrete or artificial stone containing polyepoxides

e.g. POLYETHYLENE OXIDE

C04B 26/16

Polyurethanes

Definition statement

This place covers:

Compositions of mortars, concrete or artificial stone containing polyurethanes

e.g. castor oil, polymerises with isocyanates

C04B 26/18

Polyesters; Polycarbonates

References

Limiting references

This place does not cover:

polyester compositions	C08L 67/00 + F (inorganic filler); C08L 67/02 (saturated); C08L 67/06 (unsaturated)

C04B 26/22

Natural resins, e.g. rosin

Definition statement

This place covers:

Compositions of mortars, concrete or artificial stone containing natural resins as organic binders

e.g. ARAUCARIA RESIN

C04B 26/26

Bituminous materials, e.g. tar, pitch {(C08L 95/00 takes precedence)}

Definition statement

This place covers:

Compositions of mortars, concrete or artificial stone containing bituminous materials as organic binders

e.g. PARAFFIN;

e.g. tar + asphalt + sulphur

Relationships with other classification places

Construction of, or surfaces for roads E01C

References

Limiting references

This place does not cover:

Compositions of bituminous materials	C08L 95/00

Synonyms and Keywords

In patent documents, the following abbreviations are often used

"HOLZZEMENT" = tar + asphalt + sulphur

C04B 26/285

{Cellulose or derivatives thereof, e.g. starch (C04B 26/24 takes precedence)}

Definition statement

This place covers:

Compositions of mortars, concrete or artificial stone containing cellulose or derivatives thereof as organic binders

e.g. "ZELLIN"

References

Limiting references

This place does not cover:

Compositions of mortars, concrete or artificial stone containing cellulosic waste liquor as organic binder	C04B 26/24

Synonyms and Keywords

In patent documents, the following abbreviations are often used

"ZELLIN"

C04B 28/00

Compositions of mortars, concrete or artificial stone, containing inorganic binders or the reaction product of an inorganic and an organic binder, e.g. polycarboxylate cements

Definition statement

This place covers:

Compositions of mortars, concrete or artificial stone, containing inorganic binders or the reaction product of an inorganic and an organic binder

e.g. (water soluble) fluorosilicate as binder

References

Limiting references

This place does not cover:

Dental cements	A61K 6/06
Surgical cements	A61L 24/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Oil well cements containing inorganic binders	C04B 28/00
According to the composition and receive also	C09K 8/46

Special rules of classification

Classification is made according to the binder used, applying last place rule (LPR). Fillers and active ingredients are classified using the C-set symbols chosen from C04B 14/00, C04B 16/00, C04B 18/00, C04B 22/00 or C04B 24/00. If one of these ingredients is (or suspected to be) new or unusual or special details describing this ingredient are given, classification is also made for this ingredient.

When more than one inorganic binders are used, classification is made in C04B 28/00 according to LPR and the second or third binder are indicated with entries chosen from C04B 7/00 or C04B 11/00 (or if one of these binders can be seen as an active ingredient e.g. lime, from C04B 22/00).

C04B 28/001

{containing unburned clay (polymer binder - clay mixtures used in well cementing C09K 8/44)}

Definition statement

This place covers:

Compositions of mortars, concrete or artificial stone, containing unburned clay as inorganic binders

e.g. clay + NAOH mixtures as binder;

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Polymer binder - clay mixtures used in well cementing	C09K 8/44

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

TORCHIS" = COB = DAUB	clay + straw

C04B 28/005

{containing gelatineous or gel forming binders, e.g. gelatineous Al(OH)3, sol-gel binders}

Definition statement

This place covers:

Compositions of mortars, concrete or artificial stone, containing gelatineous or gel forming binders

e.g. $Al(OH)_3$;

e.g. Al2(OH)xXy

C04B 28/006

{containing mineral polymers, e.g. geopolymers of the Davidovits type}

Definition statement

This place covers:

Compositions of mortars, concrete or artificial stone, containing mineral polymers as inorganic binders

e.g. TECTOALUMINOSILICATE;

e.g. POLY(SIALATE) (-Si-O-Al-O-) (PS);

e.g. POLY(SIALATE-SILOXO) (-Si-O-Al-O-Si-O-) (PSS);

e.g. POLY(SIALATE-DISILOXO) (-SI-O-Al-O-Si-O-Si-O-) (PSDS)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Alkali-activated cements	C04B 28/26

C04B 28/021

{Ash cements, e.g. fly ash cements (fly ash as filler C04B 18/08); Cements based on incineration residues, e.g. alkali-activated slags from waste incineration (alkali-activated combustion residues as such C04B 7/243; mixtures of the lime-pozzuolane type C04B 28/18); Kiln dust cements}

References

Limiting references

This place does not cover:

Alkali-activated combustion residues	C04B 7/243
Fly ash as filler	C04B 18/08
Mixtures of the lime-pozzuolane type	C04B 28/18

Special rules of classification

when the alkali activated waste results in a polymeric - Davidovits type - cement, additional classification in C04B 28/006 should be given

C04B 28/04

Portland cements

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Portland cement	Hydraulic cement produced by pulverizing clinkers consisting essentially of hydraulic calcium silicates, usually containing one or more of the forms of calcium sulfate as an inter ground addition

C04B 28/06

Aluminous cements (monolithic refractories or refractory mortars C04B 35/66)

References

Limiting references

This place does not cover:

Monolithic refractories or refractory mortars	C04B 35/66

C04B 28/065

{Calcium aluminosulfate cements, e.g. cements hydrating into ettringite}

Definition statement

This place covers:

Compositions of mortars, concrete or artificial stone, containing calcium aluminosulfate cements as inorganic binders

e.g. aluminous cement + portland cement + gypsum;

C04B 28/08

Slag cements

Definition statement

This place covers:

Compositions of mortars, concrete or artificial stone, containing slag cements as inorganic binders

e.g. slag + water --> hydraulic reaction with formation of GEHLENITE or ETTRINGITE according to the base present

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Water glass as activator	C04B 28/26 + C04B 18/141

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

"Laitiers granules

C04B 28/10

Lime cements or magnesium oxide cements

References

Limiting references

This place does not cover:

Lime paints / varnishes	C09D 1/10

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- "slaked lime", "calcium hydroxide" and "hydrated lime"

C04B 28/105

{Magnesium oxide or magnesium carbonate cements}

Definition statement

This place covers:

Compositions of mortars, concrete or artificial stone, based on magnesium oxide or magnesium carbonate binders

C04B 28/12

Hydraulic lime

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Hydraulic lime	a lime mainly consisting of calcium silicates, calcium aluminates and calcium hydroxide. Produced by burning argilaceous limestones

C04B 28/14

containing calcium sulfate cements {(gypsum-paper plates E04C)}

References

Limiting references

This place does not cover:

Dentistry preparations based on gypsum	A61K 6/0625
Gypsum bandages	A61L 15/08
Gypsum-paper boards	E04C 2/043

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

VERGOLDER-GUSSMASSE	gypsum + chalk + glue

C04B 28/141

{containing dihydrated gypsum before the final hardening step, e.g. forming a dihydrated gypsum product followed by a de- and rehydration step}

Definition statement

This place covers:

Compositions of mortars, concrete or artificial stone, containing dehydrated gypsum before the final hardening step, blocks of natural gypsum as inorganic binders

C04B 28/18

containing mixtures of the silica-lime type

Special rules of classification

- the "silica" used has to be indicated (possible entries C04B 14/06+, C04B 18/08 etc.) but the lime is not classified separately, as it is considered inherent to the composition.

Rules of classification:

- Ca silicate --> final product : C04B 28/188,...; - Ca silicate + CaO + "SiO2" --> final product : C04B 28/188 , "C04B 14/00:06", ... ;
- CaO + "SiO2" --> Ca silicate --> final product : C04B 28/186,"C04B 14/00:06", ... ;

- CaO + "SiO2" --> Ca silicate + CaO + "SiO2" --> final product: (C04B 28/186,"C04B 14/00:06",..) (C04B 28/186, "C04B 14/00:06", C04B 28/188);
- C04B 28/188 as a symbol means : Ca silicate as an intermediate product, mixed with a second CaO-"SiO2" mixture.

C04B 28/186

{containing formed Ca-silicates before the final hardening step}

Special rules of classification

see rules in C04B 28/18

C04B 28/188

{the Ca-silicates being present in the starting mixture}

Special rules of classification

See rules in C04B 28/18

C04B 28/24

containing alkyl, ammonium or metal silicates; containing silica sols {(reaction mixtures resulting in mineral polymers C04B 28/006; polymeric reaction products of alkali metal silicates with isocyanates C08G 18/3895)}

References

Limiting references

This place does not cover:

Colloidal silica as filler	C04B 14/062
(water soluble) fluorosilicates as binder	C04B 28/00
Reaction mixtures resulting in mineral polymers	C04B 28/006
Fibres + colloidal silica	C04B 30/02
Polymeric reaction products of alkali metal silicates with isocyanates	C08G 18/3895

C04B 28/26

Silicates of the alkali metals

References

Limiting references

This place does not cover:

Reaction mixtures resulting in mineral polymers	C04B 28/006
Foundry moulds based on alkali metal silicates	B22C 1/18
Alkali metal silicates as such	C01B 33/32
Paints based on alkali metal silicates	C09D 1/02
Adhesives based on alkali metal silicates	C09J 1/02
For soil stabilisation	C09K 17/12

Use of waterglass in road making	E01C 7/10

C04B 28/28

containing organic polyacids, e.g. polycarboxylate cements, {i.e. ionomeric systems}

References

Limiting references

This place does not cover:

Dental cements	A61K 6/0835
Surgical ionomer cements	A61L 24/12

C04B 28/30

containing magnesium cements {or similar cements} (magnesium oxide cements C04B 28/10)

References

Limiting references

This place does not cover:

Magnesium oxide cements	C04B 28/10

C04B 28/32

Magnesium oxychloride cements, e.g. Sorel cement

References

Limiting references

This place does not cover:

Dental cements	A61K 6/06

C04B 28/34

containing cold phosphate binders

Relationships with other classification places

Preparations for dental purposes	A61K 6/00
Surgical cements	A61L 24/00
Materials for prostheses	A61L 27/00

References

Limiting references

This place does not cover:

Coating of metals in general	C23C 22/00

Special rules of classification

- since 1/4/92 classification is done according to the note following C04B 28/34;

- ammonium compounds are considered to be alkali metal compounds;

- phosphate compositions for coating metallic surfaces (for passivating purposes) are classified in C04B 28/34 and subgroups and receive C04B 2111/00525 as symbol

- starting mixture of oxide + phosphate C04B 28/34;

- starting mixture of acid + oxide C04B 28/342;

- starting mixture containing phosphate only C04B 28/344;

- starting mixture of acid + phosphate C04B 28/346;

- starting mixture of acid + oxide + phosphate C04B 28/348

C04B 30/00

Compositions for artificial stone, not containing binders

References

Limiting references

This place does not cover:

Insulation for cavity walls	E04B 1/7604

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Artificial stone, i.e. cast stone	Synthetic stone compounds

C04B 30/02

containing fibrous materials

Definition statement

This place covers:

- in principle as defined in the title- no binder;
- but also e.g. fibers held together with a minor amount of binder can receive C04B 30/02 as additional class (in which case the binder is indexed from C04B 7/00 if inorganic, or C04B 24/00 if organic);
- also fibers held together by minor amounts of e.g. refractory oxides- these oxides are then indexed as filler from C04B 14/00

C04B 32/005

{Artificial stone obtained by melting at least part of the composition, e.g. metal (C04B 28/36 and C03C take precedence; cast stone from molten slag C04B 5/00; artificial stone obtained by melting the polymeric ingredient of the composition C04B 26/00)}

References

Limiting references

This place does not cover:

Cast stone from molten slag	C04B 5/00
Artificial stone obtained by melting the polymeric ingredient of the composition	C04B 26/00
Compositions of mortars, concrete or artificial stone containing sulphur, sulphides or selenium, as inorganic binder	C04B 28/36
Glass compositions containing a non-glass component	C03C 14/00

C04B 32/02

with reinforcements {(contains no documents; reinforcing elements E04C 5/00)}

Definition statement

This place covers:

This group is only used as symbol in the C-set to indicate the presence of reinforcements (in the sense of E04C 5/00). The group itself does not contain any documents

References

Limiting references

This place does not cover:

Cathodic protection of reinforced concrete	C23F 13/02
Reinforcing elements for concrete	E04C 5/00

C04B 33/00

Clay-wares (monolithic refractories or refractory mortars C04B 35/66; porous products C04B 38/00)

Definition statement

This place covers:

All ceramic products based on clay materials, the processing of clay materials preparatory to the making of clay products, the following shaping methods for clay materials: slip-casting (C04B 33/28) and dry-pressing (C04B 33/20).

Relationships with other classification places

working by grinding or polishing B24

Processes for the shaping of clay materials, except for slip-casting (C04B 33/28) and dry-pressing (C04B 33/20) B28B

Preparing clay; producing mixtures containing clay B28C

Working stone or stone-like materials, e.g. brick, concrete or glass , not provided for elsewhere; machines, devices, tools therefore B28D

References

Limiting references

This place does not cover:

Granular clay used as filler in cement, concrete or artificial stone	C04B 14/10
Heat treating clay to expand it for use as filler in cement, concrete or artificial stone	C04B 20/06
Clay used as active ingredient in cement, concrete or artificial stone	C04B 24/40
Unburned clays used as filler in cement, concrete or artificial stone	C04B 28/001
Ceramic materials based on silicates other than clays	C04B 35/16
Creating porosity in a ceramic, cement, concrete, mortar or artificial stone by using expanding clay	C04B 38/064
Coating or impregnating a ceramic substrate with clay	C04B 41/5037
Aspects relating to ceramic starting mixtures or sintered ceramic products	C04B 2235/00 and subgroups
Aspects relating to ceramic laminates or to joining of ceramic articles with other articles by heating	C04B 2237/00 and subgroups
Clays used in catalysts	B01J 21/16, B01J 21/16
Clays used in molecular sieves	B01J 29/049, B01J 29/049
Clay used as binding agent in refractory moulds	B22C 1/181
Clay moulds for slip-casting metals	B22F 3/22
Devitrified glass-ceramics	C03C 10/00 and subgroups
Use of clays as compounding ingredient for polymers	C08K 3/346, C08K 3/346
Treatment of clay materials to enhance pigmenting or filling properties for non-clay and non-ceramic products (usually for polymer products)	C09C 1/42, C09C 1/42
Interference pigments characterized by the core material, the core consisting of glass or silicate material like mica or clays, e.g. kaolin	C09C 2200/102
Coverings or linings, e.g. for walls or ceilings with an outer layer of ceramics or clay	E04F 13/142
Rigid pipes of glass or ceramics, e.g. clay, clay tile, porcelain	F16L 9/10

Informative references

Attention is drawn to the following places, which may be of interest for search:

Monolithic refractories or refractory mortars	C04B 35/66
Joining of a ceramic or clay layer to another layer	C04B 37/00 and subclasses

Porous ceramic products	C04B 38/00 and subclasses
Aluminium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. bauxite, alpha-alumina	C04B 2235/3217 and subgroups
Silica as starting material for making a ceramic or as secondary phase of a sintered ceramic	C04B 2235/3418
Silicates other than clay as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. water glass (Na_2SiO_3)	C04B 2235/3427 and subgroups
Clays as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. bentonites/smectites such as montmorillonite, kaolines such as halloysite, illite, talc, sepiolite and attapulgite, vermiculite	C04B 2235/349
Clays added to foodstuffs	A23L 33/29
Clay used in cosmetics	A61K 8/26
Clay used in medicines	A61K 33/06
Clays used for solid sorbents or as filter aid	B01J 20/12, B01D 2253/11
Catalysts comprising clays or other mineral silicates	B01J 21/16, B01J 21/16, C07C 2521/16
Proportioning the ingredients for mixing clay or cement with other substances	B28C 7/00
Resin-bonded materials containing containing mineral aggregates, e.g. sand, clay or the like	B29K 2303/08
Laminated products composed mainly of ceramics, e.g. clay ceramics	B32B 18/00
Using clay fillers in resin laminates	B32B 27/20
Clay used as pigment in printing ink	B41M 5/1555
Clay used in the coating of printing paper	B41M 5/5218, B41M 5/5218
Modelling clay for creating decorative effects	B44C 3/04
Making or composition of clay compounds (powders)	C01B 33/40
Preparation of acyclic or carbocyclic hydrocarbons, using clay catalysts	C07C 2521/16, C07C 2529/04 and subgroups
Clay used in aqueous well drilling compositions	C09K 8/04 and subclasses
Chemical nature of materials in mouldable or extrudable form for sealing or packing joints or covers, clays	C09K 2200/0252 and subgroups
Clay used in lubricant compositions	C10M 113/10 , C10M 125/30, C10M 2201/103 and subgroups
Clays used in detergent compositions	C11D 3/1253
Clay used as carrier in detergent compositions	C11D 3/505
Clay used in pulp compositions	D21H 17/68, D21H 17/68
Clay pigments used for coating paper	D21H 19/40, D21H 19/40

Clays used in foundations, excavations, embankments, underground or underwater structure	E02D 2300/0037 and subgroups
Machines for obtaining or the removal of materials in open-pit mines, for quarrying stone, sand, gravel, or clay	E21C 47/10
Rigid pipes, of glass or ceramics, e.g. clay, clay tile, porcelain	F16L 9/10
Apparatus for preheating charges or arrangements for preheating charges: drying of green clay prior to baking	F27D 13/005, F27D 13/005
Target discs characterised by their material, structure or surface, e.g. clay pigeon targets characterised by their material	F41J 1/01
Clay-pigeon targets; clay-disc targets	F41J 9/16 and subclasses
Treating radioactively contaminated material by fixation in stable solid media in an inorganic matrix, e.g. clays, zeolites	G21F 9/162

Special rules of classification

The indexing scheme C04B 2235/00-C04B 2235/9692 is used in C04B 33/00, with the exception of a few symbols that overlap with classes in C04B 33/00. The following symbols are not used in C04B 33/00:

C04B 2235/349: clay additives

C04B 2235/5472: ceramic or refractory mixtures of materials with different sizes

C04B 2235/6027: slip-casting of ceramic or refractory mixtures

C04B 2235/604: pressing at non-sintering temperatures of ceramic or refractory mixtures

C04B 2235/606: drying of green ceramic or refractory bodies

C04B 2235/9661: colouring of ceramic or refractory materials

If the phase composition of the sintered clay material is specified, C04B 35/14, C04B 35/16 or one of its subgroups might be given to indicate the main phase of the sintered clay product.

The processing classes C04B 35/624-C04B 35/62695 are also used in the clay field, just as powder and fiber coating classes from C04B 35/628. The inorganic binder classes C04B 35/6306-C04B 35/6316 and the organic binder classes C04B 35/6325-C04B 35/638 are also used in the clay field.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Clay	Clays are distinguished from other fine-grained soils by differences in size and mineralogy. Silts, which are fine-grained soils that do not include clay minerals, tend to have larger particle sizes than clays, but there is some overlap in both particle size and other physical properties, and there are many naturally occurring deposits which include silts and also clay. The distinction between silt and clay varies by discipline. Geologists and soil scientists usually consider the separation to occur at a particle size of 2 µm (clays being finer than silts), sedimentologists often use 4-5 µm, and colloid chemists use 1 µm. Geotechnical engineers distinguish between silts and clays based on the plasticity properties of the soil, as measured by the soils' Atterberg Limits. ISO 14688 grades clay particles as being smaller than 2 µm and silts larger. Clay minerals are hydrous aluminum phyllosilicates, sometimes with variable amounts of iron, magnesium, alkali metals, alkaline earths, and other cations. Clays have structures similar to the micas and therefore form flat hexagonal sheets Clays are commonly referred to as 1:1 or 2:1. Clays are fundamentally built of tetrahedral sheets and octahedral sheets, as described in the structure section below. A 1:1 clay would consist of one tetrahedral sheet and one octahedral sheet, and examples would be kaolinite and serpentine. A 2:1 clay consists of an octahedral sheet sandwiched between two tetrahedral sheets, and examples are illite, smectite, attapulgite, and chlorite (although chlorite has an external octahedral sheet often referred to as "brucite"). Clay minerals include the following groups:Kaolin group which includes the minerals kaolinite, dickite, halloysite, and nacrite (polymorphs of $Al_2Si_2O_5(OH)_4$). Some sources include the kaolinite-serpentine group due to structural similarities. Smectite group which includes dioctahedral smectites such as montmorillonite and nontronite and trioctahedral smectites for example saponite. Illite group which includes the clay-micas. Illite is the only common mineral. Chlorite group includes a wide variety of similar minerals with considerable chemical variation. Other 2:1 clay types exist such as sepiolite or attapulgite, clays with long water channels internal to their structure. Clay mineral group Halloysite – $Al_2Si_2O_5(OH)_4$ Kaolinite – $Al_2Si_2O_5(OH)_4$ Illite – $(K,H_3O)(Al,Mg,Fe)_2(Si,Al)_4O_{10}[(OH)_2,(H_2O)]$ Montmorillonite – $(Na,Ca)_{0.33}(Al,Mg)_2Si_4O_{10}(OH)_2 \cdot nH_2O$ Vermiculite – $(MgFe,Al)_3(Al,Si)_4O_{10}(OH)_2 \cdot 4H_2O$ Talc – $Mg_3Si_4O_{10}(OH)_2$ Palygorskite – $(Mg,Al)_2Si_4O_{10}(OH) \cdot 4(H_2O)$ Pyrophyllite – $Al_2Si_4O_{10}(OH)_2$
B28B	clay means any clay or ceramic material

C04B 33/02

Preparing or treating the raw materials individually or as batches

Definition statement

This place covers:

The powders are treated either as a powder or in shaped form

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Fillers added to cement, concrete, mortar or artificial stone: expanding clay, perlite, vermiculite or like granular materials	C04B 20/06 and subgroups
Apparatus or methods for mixing clay with other substances	B28C 3/00 and subgroups
Controlling the operation of apparatus for producing mixtures of clay, ceramic or cement with other substances; supplying or proportioning the ingredients for mixing clay or cement with other substances; discharging the mixture	B28C 7/00 and subgroups

C04B 33/025

{Mixtures of materials with different sizes}

Definition statement

This place covers:

The document mentions that the inorganic starting materials deliberately have different mesh sizes, such as a fraction of < 400 mesh, a fraction of 200-400 mesh and a fraction > 200 mesh, or the document mentions different particle sizes, e.g. two fractions, one with sizes below and one with size above 0,1 mm. A certain constituent is added with two different particle sizes, by adding for instance kaolin with a size of 1 micron and kaolin with a size of 10 micron. A powder is added that contains one fraction, but this fraction has a bimodal particle size distribution.

References

Limiting references

This place does not cover:

Clay mixtures in which the organic additives have different size fractions	C04B 33/1305

Informative references

Attention is drawn to the following places, which may be of interest for search:

Fillers added to cement, concrete, mortar or artificial stone: characterised by the grain distribution: fillers with bimodal grain size distribution	C04B 20/0096
Ceramic or refractory mixtures of materials with different sizes	C04B 2235/5472
Separation of particles of different sizes through sedimentation	B01D 21/00 and subgroups
Inorganic particles per se with a bimodal particle size distribution	C01P 2004/53

Special rules of classification

This class is not complete. The years 1981-2005 are missing. Some documents with clay-mixtures of materials with different sizes might have the symbol C04B 2235/5472.

C04B 33/04

clay; kaolin

Definition statement

This place covers:

Mixtures contain clay or kaolin additives

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating ceramic substrates with clay/kaolin	C04B 41/5037 and subgroups
Clays as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. bentonites/smectites such as montmorillonite, kaolines such as halloysite, illite, talc, sepiolite and attapulgite, vermiculite	C04B 2235/349

C04B 33/06

Rendering lime harmless

Definition statement

This place covers:

The lime in or for the clay material is reacted to form calcium alumino-silicate phases

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Calcium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. lime	C04B 2235/3208

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Lime	calcium oxide or calcium hydroxide

C04B 33/08

Preventing efflorescence

Definition statement

This place covers:

Any method that prevents the efflorescence (or salting out) of salts present in the clay mixture or present in the starting materials to be used for forming a clay mixture

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Metal salts chosen for the nature of the anions as starting material for making ceramics, e.g. phosphides, hydrides, acetylacetonate, hydroxides, or present as secondary phase in the sintered ceramic	C04B 2235/44 and subgroups
Products characterised by the absence or the low content of specific components, e.g. alkali metal free alumina ceramics	C04B 2235/72 and subgroups

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Efflorescence	the loss of water (or a solvent) of crystallization from a hydrated or solvated salt to the atmosphere on exposure to air.

C04B 33/10

Eliminating iron or lime

Definition statement

This place covers:

Removing lime or iron salts from the clay mixture

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Calcium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. lime	C04B 2235/3208
Iron oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. hematite (Fe_2O_3) or magnetite (Fe_3O_4)	C04B 2235/3272 and subgroup
Products characterised by the absence or the low content of specific components, e.g. alkali metal free alumina ceramics	C04B 2235/72 and subgroups
Separation of particles of different sizes through sedimentation	B01D 21/00 and subgroups

C04B 33/13

Compounding ingredients (C04B 33/36, C04B 35/71 take precedence; {pigments for ceramics C09C 1/0009})

Definition statement

This place covers:

Preparing mixtures for making clay materials, e.g. adding waste glass to a clay mixture.

References

Limiting references

This place does not cover:

Reinforced clay wares	C04B 33/36
Reinforced ceramics	C04B 35/71 and subgroups
Apparatus or methods for producing or N:processing clay suspensions, e.g. slip	B28C 1/02 and subgroups
Apparatus or methods for processing clay-containing substances in non-fluid condition	B28C 1/10 and subgroups
Supplying or proportioning the ingredients	B28C 7/04 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Glass starting materials for making ceramics, e.g. silica glass	C04B 2235/36 and subgroup
Pigments for ceramics	C09C 1/0009

Special rules of classification

If waste glass is used, the symbol C04B 2235/36 is added as well.

C04B 33/1305

{Organic additives}

Definition statement

This place covers:

All organic additives added to form the product

References

Limiting references

This place does not cover:

Organic additives added to ceramic or refractory mixtures	C04B 35/632 and subclasses
Organic additives that are added to the clay material to create porosity after a heat treatment	C04B 38/06 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Alkoxides as starting material for making ceramics, e.g. methoxide, tert-butoxide	C04B 2235/441
Organic acids as starting material for making ceramics, e.g., EDTA, citrate, acetate, oxalate	C04B 2235/449

Organic compounds becoming part of a ceramic after heat treatment, e.g. carbonising phenol resins	C04B 2235/48 and subgroups
Organic fibers used as starting material for making ceramics	C04B 2235/5212

Special rules of classification

If a certain polymer is specified as additive, one of the subclasses of C04B 35/634 can be given, to indicate the specific polymer. C04B 35/6325, C04B 35/636, C04B 35/6365 and C04B 35/638 can be used as well. A certain amount of documents of clay mixtures with organic additives might have received C04B 35/632 or one of the subclasses, such as one of the polymer additive classes (C04B 35/634 and subclasses) without having received the class C04B 33/1305. If the organic additive is a binder, C04B 33/1315 is given as well.

C04B 33/131

{Inorganic additives}

Definition statement

This place covers:

All inorganic additives added to form the product

References

Limiting references

This place does not cover:

Inorganic additives to ceramic or refractory mixtures	C04B 35/6303 and subclasses
Inorganic additives that are added to the clay material to create porosity after a heat treatment	C04B 38/06 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Metal oxides, mixed metal oxides or oxide forming salts thereof, e.g. carbonates, nitrates, (oxy)hydroxides, chlorides, as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/32 and subgroups
Non-metal oxides, mixed non-metal oxides or oxide forming salts thereof, e.g. carbonates, nitrates, (oxy)hydroxides, chlorides, as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/34 and subgroups
Glass starting materials for making ceramics, e.g. silica glass	C04B 2235/36 and subgroup
Non-oxides as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/38 and subgroups
Metal as starting material for making ceramics or as secondary phase of a sintered ceramic, not being present as a binding phase, e.g. La, Y, Mn, Re, Zn, Ga, In, Ge, Sb, Pb, Bi	C04B 2235/40 and subgroups
Non metallic elements as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. sulphur, phosphor, selenium or tellurium	C04B 2235/42 and subgroups

Special rules of classification

If a certain inorganic is specified as additive, C04B 35/6306 or one of its subclasses, or C04B 35/6316 can, if appropriate be given. A certain amount of documents of clay mixtures with inorganic additives might have received C04B 35/6303 or one of the subclasses without having received the class C04B 33/131. The class has not been used in the years 1983-2005. If the inorganic additive is a binder, C04B 33/1315 is given as well. If none of the subclasses of C04B 35/6303 is appropriate, symbol from the range C04B 2235/32-C04B 2235/549 can be given.

C04B 33/1315

{Non-ceramic binders}

Definition statement

This place covers:

Binders for clay mixtures that are neither clay materials themselves nor ceramic materials as classified in C04B 35/01-C04B 35/597.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Binders for ceramic products	C04B 35/63- C04B 35/638
Binders for refractory moulds	B22C 1/16 and subgroups

Special rules of classification

The binder is normally also classified in either C04B 33/1305 or C04B 33/131. If the binder is one of the materials classified in C04B 35/6306 (and subclasses), C04B 35/6316, C04B 35/634 (and subclasses) or C04B 35/636 (and subclasses), the respective additive class from C04B 35/00 is given as well. If none of the subclasses of C04B 35/6303 or C04B 35/632 is appropriate, symbol from the range C04B 2235/32-C04B 2235/549 can be given.

C04B 33/132

Waste materials; Refuse; {Residues} (C04B 33/16 takes precedence; {waste glass C04B 33/13})

Definition statement

This place covers:

The use of waste materials to make clay objects, not covered by any of the subclasses, such as silica fume, except for waste glass.

Relationships with other classification places

Disposal of solid waste B09B

Removing ash, clinker, or slag from combustion chamber **F21J**

References

Limiting references

This place does not cover:

The addition of waste glass to clay materials	C04B 33/13
Adding lean materials, e.g. grog quartz	C04B 33/16
The addition of waste materials to ceramic or refractory mixtures	C04B 35/62204 and subgroups
Waste materials that are added to the clay material to create porosity after a heat treatment	C04B 38/065

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cements containing slag	C04B 7/14 and subgroups
Use of waste materials or refuse as fillers for mortars, concrete or artificial stone	C04B 18/04 and subgroups
Use of agglomerated or waste materials or refuse as fillers for mortars, concrete or artificial stone, or treatment of agglomerated or waste materials or refuse, specially adapted to enhance their filling properties in mortars, concrete or artificial stone: waste material from metallurgical processes being silica fume	C04B 18/146 and subgroups
Use of inorganic materials as active ingredients for mortars, concrete or artificial stone, e.g. accelerators: waste inorganic materials	C04B 22/0006
Coating or impregnating of mortars, concrete, artificial stone or ceramics with waste materials	C04B 41/4598
Phosphates or phosphites (calcium phosphates C04B 2235/3212) as starting material for making ceramics, e.g. orthophosphate (PO_4^{3-}), pyrophosphate ($P_2O_7^{4-}$), hypophosphite ($H_2PO_2^-$), or present as secondary phase in the sintered ceramic	C04B 2235/447
Manufacture of articles from scrap or waste metal particles	B22F 8/00
Active carbon from waste materials, e.g. tyres, spent sulphite pulp liquor	C01B 31/081
Preparation of alkali metal aluminates; aluminium oxide or hydroxide there from by treating aluminous minerals or waste-like raw materials with alkali hydroxide,	C01F 7/06
Melting in furnaces of glass-forming waste materials	C03B 5/005
Use of waste materials, e.g. slags as ingredients generally applicable to manufacture of glasses, glazes, or vitreous enamels	C03C 1/002
Devitrified glass ceramics containing waste materials, e.g. slags	C03C 10/0063
Foundations for pavings characterised by material or composition used, e.g. waste or recycled material	E01C 3/003

Special rules of classification

If more than one type of waste is used as additive for making one and the same clay object, all types of wastes are indicated with the appropriate class. Also when only small amounts are added, e.g. less than 5 wt% of the respective waste material, it is still being classified.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Devitrified glass ceramics	glass ceramics having a crystalline phase dispersed in a glassy phase and constituting at least 50% by weight of the total composition

C04B 33/1321

{Waste slurries, e.g. harbour sludge, industrial muds (slurries of specific well-defined waste streams, e.g. phosphate muds, other than red mud, C04B 33/132)}

Definition statement

This place covers:

The use of waste slurries such as unburned sewage sludge for making clay objects

Relationships with other classification places

Treatment of water, waste water, sewage, or sludge C02F

References

Limiting references

This place does not cover:

Slurries of specific well-defined waste streams, e.g. phosphate muds, other than red mud	C04B 33/132
The use of burned sewage sludge for making clay objects	C04B 33/1357

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of waste materials or refuse as fillers for mortars, concrete or artificial stone: wet materials, e.g. slurries	C04B 18/0418
Use of waste materials or refuse as fillers for mortars, concrete or artificial stone: dredged harbour or river sludge	C04B 18/0436
Use of inorganic materials as active ingredients for mortars, concrete or artificial stone, e.g. accelerators: waste slurries or solutions used as gauging water	C04B 22/0046
Use of inorganic or non-macromolecular organic substances as compounding ingredients in polymers: waste materials, e.g. treated or untreated sewage sludge	C08K 11/005
Incineration of waste adapted for burning two or more kinds, e.g. liquid and solid, of waste being fed through separate inlets	F23G 5/008
Incinerators or other apparatus for consuming industrial waste for sludges or waste products from water treatment installations	F23G 7/001

C04B 33/1322

{Red mud}

Definition statement

This place covers:

The use of unburned red mud for making clay objects

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of waste materials or refuse as fillers for mortars, concrete or artificial stone, e.g. waste from the purification of bauxite, e.g. red mud	C04B 18/0409
Titanium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. rutile or anatase	C04B 2235/3232 and subgroups
Iron oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. hematite (Fe_2O_3) or magnetite (Fe_3O_4)	C04B 2235/3272 and subgroup
Preparation of alkali metal aluminates; aluminium oxide or hydroxide there from by treating aluminous minerals or waste-like raw materials with alkali hydroxide: separation of the insoluble residue, e.g. red mud	C01F 7/0646 and subgroup

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Red mud	Is a solid waste product of the Bayer process, the principal industrial means of refining bauxite in order to provide alumina as raw material for the electrolysis of aluminium by the Hall–Héroult process. A typical plant produces one to two times as much red mud as alumina. This ratio is dependent on the type of bauxite used in the refining process. Red mud is composed of a mixture of solid and metallic oxide-bearing impurities, and presents one of the aluminium industry's most important disposal problems. The red colour is caused by the oxidised iron present, which can make up to 60% of the mass of the red mud. In addition to iron, the other dominant particles include silica, unleached residual aluminium, and titanium oxide.

C04B 33/1324

{Recycled material, e.g. tile dust, stone waste, spent refractory material}

Definition statement

This place covers:

Residues from sawing stones or ceramics, left refractory material, etc. is used for making a clay product

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Hydraulic cements from waste building materials, e.g. waste asbestos-cement products, demolition waste	C04B 7/246
Use of waste materials or refuse as fillers for mortars, concrete or artificial stone: waste from quarries, mining or the like	C04B 18/12 and subgroup
Use of waste materials or refuse as fillers for mortars, concrete or artificial stone: waste from building or ceramic industry	C04B 18/16 and subgroup
Grain-sized magnesia-based refractories	C04B 35/043 and subgroups
Grain-sized alumina-based refractories	C04B 35/101 and subgroups
Grain-sized titania-based refractories	C04B 35/46 and C04B 35/66
Grain-sized zirconia-based refractories	C04B 35/482
Grain-sized silicon carbide-based refractories	C04B 35/565 and subgroups, and **C04B45/66**
Monolithic refractories or refractory mortars	C04B 35/66
Compositions of refractory mould or core materials; grain structures thereof	B22C 1/00 and subgroups

C04B 33/1325

{Hazardous waste other than combustion residues (dredging sludge C04B 33/1321)}

Definition statement

This place covers:

For instance waste containing halogens.

References

Limiting references

This place does not cover:

Treating radioactively contaminated material; decontamination arrangements therefore; treating liquids by fixation in an inorganic matrix, e.g. clays, zeolite	G21F 9/162
Treating radioactively contaminated material; decontamination arrangements therefore; treating solids by fixation in an inorganic matrix	G21F 9/302

Informative references

Attention is drawn to the following places, which may be of interest for search:

Waste asbestos fibers added as filler to concrete, cement, mortar or artificial stone	C04B 14/405

Use of waste materials or refuse as fillers for mortars, concrete or artificial stone: hazardous waste	C04B 18/0463
Dredging sludge waste used for making clay wares	C04B 33/1321
Halide containing anions as starting material for making ceramics, e.g. chlorate (ClO3-), bromide (Br-), iodate (IO3-), chlorite (ClO2-), or present as secondary phase in the sintered ceramic	C04B 2235/444
Processes for making harmful chemical substances harmless or less harmful, by effecting a chemical change in the substances	A62D 3/00 and subgroups
Treating radioactively contaminated material; decontamination arrangements therefore	G21F 9/00 and subgroups

C04B 33/1327

{containing heavy metals}

Definition statement

This place covers:

Waste containing metals or metal salts such as V, Cr, Mo, W, Mn, Co, Ni, Cd, Hg, Sn, Pb, Sb, Bi, etc. being used as additive for making clay products.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of waste materials or refuse as fillers for mortars, concrete or artificial stone: hazardous waste contaminated by heavy metals	C04B 18/0472
Rare earth oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Sc_2O_3, Lu_2O_3, Nd_2O_3	C04B 2235/3224
Vanadium oxides, vanadates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. magnesium vanadate ($Mg_2V_2O_7$).	C04B 2235/3239
Chromium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Cr_2O_3	C04B 2235/3241 and subgroup
Niobium or tantalum oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Nb_2O_5 or Ta_2O_5	C04B 2235/3251 and subgroup
Molybdenum oxides, molybdates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. cadmium molybdate ($CdMoO_4$)	C04B 2235/3256
Tungsten oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. scheelite ($CaWO_4$)	C04B 2235/3258 and subgroup
Manganese or rhenium oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. MnO	C04B 2235/3262 and subgroups

Cobalt oxides, cobaltites or cobaltates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. zinc cobaltite ($ZnCo_2O_4$) or bismuth cobaltate ($BiCoO_3$)	C04B 2235/3275 and subgroup
Nickel oxides, nickelates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. NiO	C04B 2235/3279
Copper oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. CuO or Cu_2O	C04B 2235/3281 and subgroup
Zinc oxides, zincates, cadmium oxides, cadmiates, mercury oxides, mercurates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. ZnO	C04B 2235/3284
Gallium oxides, gallates, indium oxides, indates, thallium oxides, thallates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. zinc gallate ($ZnGa_2O_4$)	C04B 2235/3286
Germanium oxides, N:antimonite or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. copper N:antimonite ($CuGeO_3$)	C04B 2235/3287
Noble metal oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. IrO_2, PdO, RhO_2	C04B 2235/3289 and subgroup
Tin oxides, stannates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g., indium tin oxide (ITO)	C04B 2235/3293
Antimony oxides, antimonates, antimonites or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, indium antimonite ($InSbO_4$)	C04B 2235/3294
Lead oxides, plumbates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. silver plumbate ($Ag_5Pb_2O_6$)	C04B 2235/3296
Bismuth oxides, bismuthates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. zinc bismuthate ($Zn(BiO_3)_2$)	C04B 2235/3298

C04B 33/1328

{without additional clay}

Definition statement

This place covers:

Alumino-silicate products made by sintering waste materials, without adding any clay material.

Special rules of classification

Normally a document that is classified in this class will also receive one of the other waste classes from C04B 33/00, to indicate the type of waste material.

C04B 33/135

Combustion residues, e.g fly ash, incineration waste {(silica fume C04B 33/132)}

Definition statement

This place covers:

The residues of the combustion of all wastes not covered by one of the subgroups, e.g. residues of the combustion of hazardous waste, refuse

Relationships with other classification places

Removal or treatment of combustion products or combustion residues F23J

References

Limiting references

This place does not cover:

Fly ash used in cement	C04B 28/021
Silica fume added as ingredient for clay mixtures	C04B 33/132

Informative references

Attention is drawn to the following places, which may be of interest for search:

Hydraulic cements from combustion residues, e.g. ashes or slags from waste incineration	C04B 7/28
Use of waste materials or refuse as fillers for mortars, concrete or artificial stone: combustion residues, e.g. purification products of smoke, fumes or exhaust gases	C04B 18/06 and subgroups
Hydraulic ash cements, e.g. fly ash cements, cements based on incineration residues, kiln dust cements	C04B 28/021
Porous mortars, concrete, artificial stone or ceramic ware, by burning-out added substances: waste material; refuse other than vegetable refuse	C04B 38/0665
Chemical or biological purification of waste gases	B01D 53/34

C04B 33/1352

{Fuel ashes, e.g. fly ash}

Definition statement

This place covers:

All fuel ashes, usually coal ashes from the burning of coal, which results in a light fraction, the fly ash or flue dust and the heavy fraction the (coal) bottom ash.

References

Limiting references

This place does not cover:

Ashes, such as fly ashes, from the burning of household waste, municipal waste, industrial waste, general garbage and sewage sludge	C04B 33/1355 and C04B 33/1357

Informative references

Attention is drawn to the following places, which may be of interest for search:

Slaking of impure quick lime, e.g. contained in fly ash	C04B 2/063
Hydraulic cements with activators or composition-correcting additives, e.g. mixtures of fly ash and alkali activators	C04B 7/243
Hydraulic cements from raw materials containing flue dust, i.e. fly ash	C04B 7/26
Use of waste materials or refuse as fillers for mortars, concrete or artificial stone: residues from coal gasification	C04B 18/065
Use of waste materials or refuse as fillers for mortars, concrete or artificial stone: combustion residues: flue dust, i.e. fly ash	C04B 18/08 and subgroups
Ash cements, e.g. fly ash cements	C04B 28/021
Preparation of alkali metal aluminates; aluminium oxide or hydroxide there from by treating aluminous minerals from waste-like raw materials, e.g. fly ash, Bayer calcination dust with alkali hydroxide,	C01F 7/0693
Working up raw materials other than ores, e.g. scrap, to produce non-ferrous metals and compounds thereof: working-up flue dust	C22B 7/02, C22B 7/02
Devices for conducting smoke or fumes, e.g. flues	F23J 11/00 and subgroups
Fittings for chimneys or flues	F23J 13/00 and subgroups
Arrangement of devices for treating smoke or fumes	F23J 15/00 and subgroups

C04B 33/1355

{Incineration residues}

Definition statement

This place covers:

The residues from the incineration of household waste, municipal waste, industrial waste, general garbage

References

Limiting references

This place does not cover:

All ashes from fuel burning, such as fly ash or bottom ash from coal combustion	C04B 33/1352

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cements containing slags from waste incineration	C04B 7/28
Use of waste materials or refuse as fillers for mortars, concrete or artificial stone: combustion residues: burned or pyrolised refuse	C04B 18/10 and subgroups
Incineration of waste, incinerator constructions; details, accessories or control therefore	F23G 5/00 and subgroups

Incinerators or other apparatus for consuming industrial waste, e.g. chemicals	F23G 7/00 and subgroups
Treating radioactively contaminated material; decontamination arrangements therefore; treating liquids by incineration; by calcination, e.g. desiccation	G21F 9/14
Treating radioactively contaminated material; decontamination arrangements therefore; treating solids by incineration	G21F 9/32

C04B 33/1357

{Sewage sludge ash or slag}

Definition statement

This place covers:

Sewage sludge that has been burned/incinerated is used as additive for making clay objects

References

Limiting references

This place does not cover:

Sewage sludge that not has been burned/incinerated is used as additive for making clay objects	C04B 33/132

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of waste materials or refuse as fillers for mortars, concrete or artificial stone: combustion residues: burned or pyrolised sludges	C04B 18/103
Incinerators or other apparatus for consuming industrial waste, e.g. chemicals for sludges or waste products from water treatment installations	F23G 7/001

C04B 33/138

from metallurgical processes, e.g. slag, furnace dust, galvanic waste

Definition statement

This place covers:

Waste materials resulting from metallurgical processes that are used for making clay products.

References

Limiting references

This place does not cover:

Use of silica fume from metallurgical processes for making clay materials	C04B 33/132
Combusted metallurgical waste products used for making clay products	C04B 33/135

Informative references

Attention is drawn to the following places, which may be of interest for search:

Treatment of metallurgical slag. Artificial stone from molten metallurgical slag	C04B 5/00 and subgroups
Hydraulic cements containing metallurgical slag	C04B 7/147 and subgroups
Use of waste materials or refuse as fillers for mortars, concrete or artificial stone: waste from metallurgical processes	C04B 18/14 and subgroup
Compositions of mortars, concrete or artificial stone, containing inorganic binders or the reaction product of an inorganic and an organic binder containing hydraulic cements other than calcium sulphates: slag cements	C04B 28/08 and subgroups
Coating or impregnating e.g. injection in masonry, partial coating of green or fired ceramics with masses bonded by inorganic slag cements	C04B 41/5083
Manufacture of articles from scrap or waste metal particles	B22F 8/00
Shaping clay or other ceramic compositions, slag or mixtures containing cementitious material e.g. plaster: specially adapted for producing articles from molten material, e.g. slag	B28B 1/54
Manufacture or treatment of flakes, fibres, or filaments from softened glass, minerals, or slags	C03B 37/00 and subgroups
Ingredients generally applicable to manufacture of glasses, glazes, or vitreous enamels: use of waste materials, e.g. slags	C03C 1/002
Devitrified glass ceramics containing waste materials, e.g. slags	C03C 10/0063
General features in the manufacture of pig-iron: recovery of by-products, e.g. slag	C21B 3/04 and subgroups
Making pig-iron in the blast furnace: making slag of special composition	C21B 5/04
Manufacture of carbon-steel: processes yielding slags of special composition	C21C 5/06 , C21C 5/36, C21C 5/54
Working up raw materials other than ores, e.g. scrap, to produce non-ferrous metals and compounds thereof: working-up slag	C22B 7/04
Equipment for removing or retaining slag	F27D 3/1545 and subgroup
Devices or methods for removing incrustations, e.g. slag, metal deposits, dust; Devices or methods for preventing the adherence of slag	F27D 25/00 and subgroup

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Devitrified glass ceramics	glass ceramics having a crystalline phase dispersed in a glassy phase and constituting at least 50% by weight of the total composition
Slag	A partially vitreous by-product of smelting ore to separate the metal fraction from the unwanted fraction. It can usually be considered to be a mixture of metal oxides and silicon dioxide. However, slags can contain metal sulfides (see also matte) and metal atoms in the elemental form.

C04B 33/14

Colouring matters

Definition statement

This place covers:

Clays products of which the colour is specified or to which a colouring additive is added.

References

Limiting references

This place does not cover:

The colouring of glazes	C04B 41/5022

Informative references

Attention is drawn to the following places, which may be of interest for search:

Iron oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. hematite (Fe_2O_3) or magnetite (Fe_3O_4)	C04B 2235/3272 and subgroup
Colouring of ceramics or refractories	C04B 2235/9661
Pigments for ceramics	C09C 1/0009, C09C 1/0009 and subgroup
Pigments exhibiting interference colours	C09C 1/0015, C09C 1/0015, C09C 2200/00 and subgroups
Pigments consisting of flaky, non-metallic substrates, characterised by a surface-region containing free metal	C09C 1/0078, C09C 1/0078
Composite particulate pigments or fillers, i.e. containing at least two solid phases, except those consisting of coated particles of one compound	C09C 1/0081, C09C 1/0081 and subgroups
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: metallic pigments or fillers	C09C 1/62, C09C 1/62 and subgroups

Special rules of classification

The colouring additives that are added, e.g. iron oxide or cobalt oxide, are normally classified with a symbol from the C04B 2235/00-scheme.

C04B 33/16

Lean materials, e.g. grog, quartz

Definition statement

This place covers:

The addition of lean materials such as grog, quartz, alumina to the clay mixture.

References

Limiting references

This place does not cover:

Materials consisting mainly out of grog/chamotte	C04B 33/22
Ceramic silica based materials	C04B 35/14
Ceramic silicate based materials	C04B 35/16 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: granular materials: quartz; sand	C04B 14/06 and subgroups
Use of agglomerated or waste materials or refuse as fillers for mortars, concrete or artificial stone, treatment of agglomerated or waste materials or refuse, specially adapted to enhance their filling properties in mortars, concrete or artificial stone: grog	C04B 18/025
Silicon oxide, silicic acids, or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. silica sol, fused silica, silica fume, cristobalite, quartz or flint, e.g. silicic acid $H_2Si_2O_5$	C04B 2235/3418

Special rules of classification

The lean materials that are added, e.g. quartz or alumina, are normally classified with a symbol from the C04B 2235/00-scheme.

If the phase composition of the sintered clay material is specified, C04B 35/16 or one of its subgroup might be given to indicate the main phase of the sintered clay product.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Grog	Also known as firesand and chamotte, is a ceramic raw material. It has high percentage of silica and alumina. It can be produced by firing selected fire clays to high temperature before grinding and screening to specific particle sizes. It can also be produced from pitchers. The particle size distribution is generally coarser in size than the other raw materials used to prepare clay bodies. It tends to be porous and have low density. It is available as a powder, mortar, or in the form of fire bricks. Grog is composed of: 40% minimum alumina (Al_2O_3), 30% minimum silica (SiO_2), 4% maximum Iron(III) oxide (Fe_2O_3), and 2% maximum of calcium oxide (CaO) and magnesium oxide (MgO) combined.[1]
Lean materials	materials having a high percentage in silica and/or alumina, containing little alkali metal oxides, alkaline earth metal oxides, iron oxides, etc.

C04B 33/18

for liquefying the batches

Definition statement

This place covers:

Making slurries of clay materials. Adding additives to facilitate the formation and/or stability of clay material slurries

Special rules of classification

The additives used to liquefy the batches are indicated with the classes C04B 33/1305, C04B 33/131 and C04B 33/1315, the classes C04B 35/6306-C04B 35/6316, C04B 35/6325 and C04B 35/63404-C04B 35/638. Symbols from the range C04B 2235/00 and subgroups can be used as well.

C04B 33/20

for dry-pressing (C04B 33/13 takes precedence)

Definition statement

This place covers:

The preparation of the powder to improve the pressing properties and methods of dry-pressing the powder.

Relationships with other classification places

Mechanical aspects of pressing clay materials B28B

Presses in general B30B

References

Limiting references

This place does not cover:

Compounding ingredients of clay mixtures	C04B 33/13 and subgroups
Dry-pressing clay at sintering temperatures	C04B 33/326

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pressing at sintering temperatures of ceramic or refractory mixtures	C04B 35/645 and subgroup
Pressing at non-sintering temperatures of ceramic or refractory mixtures	C04B 2235/604
Making metallic articles by compacting	B22F 3/02 and subgroups
Mechanical aspects of hot-pressing ceramic materials	B28B 3/025
Press moulds and press-ram assemblies for shaping clay or other ceramic compositions	B28B 7/0097

C04B 33/22

Grog products

Definition statement

This place covers:

Materials consisting mainly out of grog/chamotte

References

Limiting references

This place does not cover:

Clay products or clay compositions to which grog/chamotte is added as a minority additive	C04B 33/16

Special rules of classification

If the phase composition of the sintered clay material is specified, C04B 35/14, C04B 35/16 or one of its subgroups might be given to indicate the main phase of the sintered product.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Grog	Also known as firesand and chamotte, is a ceramic raw material. It has high percentage of silica and alumina. It can be produced by firing selected fire clays to high temperature before grinding and screening to specific particle sizes. It can also be produced from pitchers. The particle size distribution is generally coarser in size than the other raw materials used to prepare clay bodies. It tends to be porous and have low density. It is available as a powder, mortar, or in the form of fire bricks. Grog is composed of: 40% minimum alumina (Al_2O_3), 30% minimum silica (SiO_2), 4% maximum Iron(III) oxide (Fe_2O_3), and 2% maximum of calcium oxide (CaO) and magnesium oxide (MgO) combined.[1]

C04B 33/24

Manufacture of porcelain or white ware

Definition statement

This place covers:

Compositions that lead to porcelain, e.g. containing high amount of china clay, are being used

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating of green or fired ceramics with porcelain	C04B 41/5038
Porcelain or ceramic teeth	A61C 13/083
Porcelain materials for prosthesis	A61F 2310/00335

Coating or prosthesis-covering structure made of porcelain	A61F 2310/0094

Special rules of classification

If the phase composition of the sintered clay material is specified, C04B 35/14, C04B 35/16 or one of its subgroups might be given to indicate the main phase of the sintered clay product.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Porcelain	ceramic material made by heating raw materials, generally including clay in the form of kaolin, in a kiln to temperatures between 1,200 °C (2,192 °F) and 1,400 °C (2,552 °F). The toughness, strength, and translucence of porcelain arise mainly from the formation of glass and the mineral mullite within the fired body at these high temperatures

C04B 33/26

of porcelain for electrical insulation

Definition statement

This place covers:

Porcelain used in the electric industry

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Abrasives	C09K 3/14
Selection of ferrites for their magnetic properties	H01F 1/34

C04B 33/28

Slip casting (mechanical features B28B 1/26)

Definition statement

This place covers:

Slip casting of clay/porcelain mixtures

References

Limiting references

This place does not cover:

Mechanical features of slip-casting clay materials	B28B 1/26 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Slip casting of ceramic or refractory mixtures	C04B 2235/6027
Semi-permeable inorganic membranes for separation processes made by slurry techniques, e.g. die or slip-casting	B01D 67/0046
Slip casting metallic articles	B22F 3/22
Making clay or ceramic tubular articles by slip casting and moulds therefore	B28B 21/08
Slip casting plastics	B29C 41/16

C04B 33/30

Drying methods

Definition statement

This place covers:

Drying methods for clay-based powder slurries or clay-based green bodies

Relationships with other classification places

Drying solid materials or objects by removing liquid therefrom F26B

References

Limiting references

This place does not cover:

Mechanical aspects of drying clay objects	B28B 11/243

Informative references

Attention is drawn to the following places, which may be of interest for search:

Drying ceramic or refractory powder mixtures	C04B 35/62655
Processes, in general, for influencing or modifying the properties of mortars, concrete or artificial stone compositions: Selection of the hardening environment	C04B 40/02 and subgroups
Removal of physically bonded water from cement or ceramics, e.g. drying of hardened concrete	C04B 41/5307
Drying of green ceramic or refractory bodies	C04B 2235/606
Processing clay- or ceramic containing substances in non-fluid condition by heating, drying	B28C 1/227
Surface treatment of glass not in the form of fibres or filaments: drying; dehydroxylation]	C03C 23/0085

C04B 33/32

Burning methods

Definition statement

This place covers:

All specific burning and sintering methods used for shaped clay materials, e.g. using a specific heating or cooling rate, a specific furnace, a specific atmosphere

References

Limiting references

This place does not cover:

Heat treatments of clay powders	C04B 35/62645 and subgroups
Superficial sintering of clay objects with the goal of creating a porous object	C04B 38/0038 and subgroup
Mechanical aspects of sintering clay objects	B28B 11/243

Informative references

Attention is drawn to the following places, which may be of interest for search:

Heat treatment, e.g. precalcining, burning, melting; cooling of hydraulic cements	C04B 7/43 and subgroups
Burning or sintering processes of ceramic or refractory products	C04B 35/64
Processes, in general, for influencing or modifying the properties of mortars, concrete or artificial stone compositions: making use of a rise in temperature, e.g. caused by an exothermic reaction	C04B 40/0082
Processes, in general, for influencing or modifying the properties of mortars, concrete or artificial stone compositions: heating up to sintering temperatures	C04B 40/0268
After-treatment of mortars, concrete, artificial stone or ceramics: heat treatment	C04B 41/0072
Aspects relating to heat treatment of ceramic bodies such as green ceramics or pre-sintered ceramics, e.g. burning, sintering or melting processes	C04B 2235/65 and subgroups
Manufacture of workpieces or articles from metallic powder characterised by the manner of compacting or sintering; apparatus specially adapted therefore; Presses and furnaces	B22F 3/00 and subgroups
Manufacture of composite layers, workpieces, or articles, comprising metallic powder, by sintering the powder, with or without compacting wherein at least one part is obtained by sintering or compression	B22F 7/00 and subgroups
Sintering glass	C03B 19/06 and subgroups
Shaft or like vertical or substantially vertical furnaces wherein no smelting of the charge occurs, e.g. calcining or sintering furnaces	F27B 1/005, F27B 1/005

Special rules of classification

When giving this class, it should be checked if one of the symbols from the range C04B 2235/65-C04B 2235/668 is applicable. If so, this symbol should be given as well.

C04B 33/323

{involving melting, fusion or softening}

Definition statement

This place covers:

Complete melting of the clay material or at least to a large extent

References

Limiting references

This place does not cover:

Heat treatments such as] calcining; fusing pyrolysis in general	B01J 6/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Artificial stone from molten metallurgical slag	C04B 5/00 and subgroups
Artificial stone obtained by melting at least part of the composition, e.g. metal	C04B 32/005
Melting of material to make a ceramic powder	C04B 35/62665
Melting of ceramic or refractory material to make a bulk ceramic	C04B 35/653 and subgroup
Porous clay ceramics obtained by generating pores in the ceramic material while in the molten state	C04B 38/0087
Processes, in general, for influencing or modifying the properties of mortars, concrete or artificial stone composition: involving melting of at least part of the composition	C04B 40/0085
Thermally activated mortars, e.g. by melting ingredients	C04B 40/0691
Coating or impregnating "in situ", e.g. impregnating of artificial stone by subsequent melting of a compound added to the artificial stone composition	C04B 41/0018
Coating or impregnating applied from the molten state; thermal spraying, e.g. plasma spraying	C04B 41/4523 and subgroup
Superficial melting of the ceramic substrate before or during the coating or impregnating step	C04B 41/4588
Shaping methods specially adapted for producing clay or ceramic articles from molten material, e.g. slag refractory ceramic materials	B28B 1/54, B28B 1/54

Special rules of classification

When giving this class, it should be checked if one of the symbols from the range C04B 2235/65-C04B 2235/668 is applicable. If so, this symbol should be given as well.

C04B 33/326

{under pressure}

Definition statement

This place covers:

Methods such as sinterforging, HIP (Hot Isostatic Pressing), SPS (spark plasma sintering).

Relationships with other classification places

Presses in general B30B

References

Limiting references

This place does not cover:

Pressing and heating of the clay green compact at the same time at temperatures lower than the sintering temperature	C04B 33/20
Processes using ultra high pressure, e.g. for the formation of diamonds; apparatus therefore, e.g. moulds, dies	B01J 3/06 and subgroups
Mechanical aspects of hot-pressing clay materials	B28B 3/025

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pressure sintering of ceramics and refractories	C04B 35/645 and subgroup
Pressing at non-sintering temperatures of ceramic or refractory mixtures	C04B 2235/604
Using constraining layers before or during sintering of ceramic laminates or ceramic substrates that are joined with other substrates	C04B 2237/56 and subgroups
Both compacting and sintering of metallic articles	B22F 3/12
Both compacting and sintering of metallic articles by forging	B22F 3/17
Hot-pressing glass powder	C03B 19/063

Special rules of classification

When giving this class, it should be checked if one of the symbols from the range C04B 2235/65-C04B 2235/668 is applicable. If so, this symbol should be given as well. If SPS is used, C04B 2235/666 should be given as well.

C04B 33/34

combined with glazing

Definition statement

This place covers:

Applying a glaze, engobe or enamel before sintering and then sinter.

References

Limiting references

This place does not cover:

Method of applying the glaze and/or choice of the substrate for glazing	C04B 41/5022 and subgroup, C04B 41/86
Coating or impregnating ceramic substrates with engobes	C04B 41/504
Mechanical aspects of glazing clay objects	B28B 11/044
Composition of enamels and glazes	C03C 8/00 and subgroups

Special rules of classification

When giving this class, it should be checked if one of the symbols from the range C04B 2235/65-C04B 2235/668 is applicable. If so, this symbol should be given as well.

C04B 33/36

Reinforced clay-wares

Definition statement

This place covers:

Clay materials containing macro-additives such as fibers and/or whiskers, that give strength to the compact

References

Limiting references

This place does not cover:

Clay materials having additives such as binders, waste material, colouring additives	C04B 33/1315, C04B 33/132 and subgroups, C04B 33/14 (respectively)
Mechanical aspects of shaping clay objects containing fibers	B28B 1/52
Arrangements specially adapted for the production of shaped ceramic articles with elements wholly or partly embedded in the moulding material; production of reinforced objects	B28B 23/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Fibrous materials and whiskers added to cement, concrete, mortar or artificial stone	C04B 14/38 and subgroups, C04B 20/0048 and subgroups
Compositions for artificial stone, not containing binders, containing fibrous materials	C04B 30/02
Making ceramic fibers per se	C04B 35/62227
Coating ceramic and carbon fibers	C04B 35/62844 and subgroups

Ceramic material reinforced with fibers	C04B 35/71 and subclasses, e.g. C04B 35/83, C/C composites
Fibers used in ceramic composition	C04B 2235/5208 and subgroups
Fiber or whisker reinforced substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/38
Making metallic fibers per se	B22F 1/004
The synthesis of glass fibers	C03B 37/01 and subgroups
Glass fibre or filament compositions	C03C 13/00 and subgroups
Glass compositions containing a non-glass component, e.g. compositions containing fibres, filaments, whiskers, platelets, or the like, dispersed in a glass matrix	C03C 14/00
Making fibers of inorganic material, not being glass, metallic or ceramic, e.g. carbon	D01F 9/12

Special rules of classification

The classes C04B 35/71-C04B 35/83 are not used in combination with C04B 33/36. The reinforcements are indicated with symbol from the scheme C04B 2235/00-C04B 2235/549, and mainly from the range C04B 2235/5208-C04B 2235/5296 (different types of fiber additives).

C04B 35/00

Shaped ceramic products characterised by their composition {(porous ceramic products C04B 38/00; ceramic articles characterised by particular shape, see the relevant classes, e.g. linings for casting ladles, tundishes, cups or the like B22D 41/02; ceramic substrates for microelectronic semi-conductors H01L 23/15)}; Ceramics compositions (containing free metal bonded to carbides, diamond, oxides, borides, nitrides, silicides, e.g. cermets, or other metal compounds, e.g. oxynitrides or sulfides other than as macroscopic reinforcing agents C22C; {shaping of ceramics B28B}); Processing powders of inorganic compounds preparatory to the manufacturing of ceramic products {(Chemical preparation of powders of inorganic compounds C01; infiltration of sintered ceramic preforms with molten metal C04B 41/51)}

Definition statement

This place covers:

Ceramic compositions or refractories based on oxides or oxide mixtures or solid solutions of two or more oxides; processes for their manufacture.

Ceramic compositions based on rare earth compounds or on compounds of actinides; processes for their manufacture.

Ceramic compositions or refractories based on non-oxides, e.g. on carbon, sulphides, selenides, fluorides, carbides, borides, nitrides or silicides; processes for their manufacture.

Monolithic refractories or refractory mortars, including those whether or not containing clay; processes for their manufacture.

Ceramic products containing macroscopic reinforcing agents, e.g. shaped metallic or non-metallic materials; processes for their manufacture.

Shaped ceramic products or refractories characterised by their composition; processes for manufacturing these shaped ceramic products or refractories:

- Shaped products obtained by a ceramic-forming technique;
- Shaped products obtained from polymer precursors;
- Shaped products obtained by Sol-Gel processing;
- Shaped products obtained by Rapid Prototyping techniques;
- Processing powders of inorganic compounds preparatory to the manufacturing of the shaped products ;
- Additives specially adapted for forming the shaped products , e.g. binders;

Processes characterised by the burning or sintering step.

Shaped products obtained by processes involving a melting step.

Relationships with other classification places

Filters, membranes for separation processes B01D

Catalysts B01J

Working by grinding or polishing B24

Mechanical features relating to the working of mortars, concrete, stone, clay-wares or ceramics , e.g. mixing or shaping ceramic compositions, boring natural stone B28B

Chemical preparation of powders of inorganic compounds C01

Chemical composition of glasses, glazes, or vitreous enamels C03C

Treating inorganic non-fibrous materials to enhance their pigmenting or filling properties C09C, C09C

Compositions containing free metal bonded to carbides, diamond, oxides, borides, nitrides, silicides, e.g. cermets, or other metal compounds, such as oxynitrides or sulphides, other than as macroscopic reinforcing agents C22C

Furnaces, kilns, ovens, or retorts F27

Basic electric elements H01

References

Limiting references

This place does not cover:

Clay-wares	C04B 33/00 and subgroups
Devitrified glass-ceramics	C03C 10/00 and subgroups
Manufacture of carbon fibres	D01F 9/12 and subgroups
Casings, linings, walls, roofs of furnaces, kilns, ovens, or retorts	F27D 1/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Joining of a ceramic layer to another layer	C04B 37/00 and subgroups
Obtaining porous ceramic products	C04B 38/00 and subgroups
Coating or impregnating ceramic substrates with ceramic material	C04B 41/5025 and subgroups, C04B 41/87
Infiltration of sintered ceramic preforms with molten metal	C04B 41/51
Aspects relating to ceramic starting mixtures or sintered ceramic products	C04B 2235/00 and subgroups
Ceramic interlayer used for joining a ceramic with another substrate	C04B 2237/04 and subgroups
Ceramic substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/32 and subgroups
Dental prostheses, e.g. porcelain or ceramic teeth	A61C 13/08 and subgroups
Ceramic materials for prostheses or for coating prostheses	A61L 27/10 and subgroup
Ceramic material for prosthesis	A61L 27/10
Materials for catheters or for coating catheters	A61L 29/00 and subgroups
Materials for other surgical articles	A61L 31/00 and subgroups
Inorganic membranes	B01D 71/02 and subgroups
Articles characterised by particular shape, see the relevant classes, e.g. linings for casting ladles, tundishes, cups or the like	B22D 41/02 and subgroups
Producing shaped articles from the material , e.g. by slip-casting	B28B 1/00 and subgroups
Apparatus or methods for mixing clay or ceramic with other substances	B28C 3/00 and subgroups
Proportioning the ingredients for mixing clay or cement with other substances	B28C 7/00 and subgroups
Layered products essentially comprising ceramics , e.g. refractory products	B32B 18/00
Printing plates or foils; Materials therefore made entirely of inorganic materials other than natural stone or metals, e.g. ceramics, carbide materials, ferroelectric materials]	B41N 1/006, B41N 1/006
Luminescent materials	C09K 11/00 and subgroups
Fireproofing materials	C09K 21/00 and subgroups
Alloys based on carbides, oxides, borides, nitrides or silicides, e.g. cermets	C22C 29/00 and subgroups
Materials for coating by flame or plasma spraying	C23C 4/10 and subgroups
Materials for coating by sputtering, e.g. ceramic targets	C23C 14/06 and subgroups

Single crystals or homogeneous polycrystalline material with defined structure	C30B 29/00 and subgroups
Ceramics; oxides in machines or engines in general (F01) or machines for liquids (F04)	F05C 2203/08 and subgroups
Materials for parts of bearings, e.g. sliding-contact bearings	F16C 33/00 and subgroups
Materials for friction linings	F16D 69/02 and subgroups
Materials for pistons, trunk pistons, plungers	F16J 1/01 and subgroups
Materials for piston-rings or seats therefore	F16J 9/26 and subgroups
Materials for rigid pipes, of glass or ceramics, e.g. clay, clay tile, porcelain	F16L 9/10 and subgroups
Materials for protection of pipes or pipe fittings against corrosion or incrustation	F16L 58/00 and subgroups
Luminescent materials for light screens	F21V 9/16 and subgroups
Casings, linings, walls of combustion chambers characterised by the shape of the bricks or blocks	F23M 5/02 and subgroups
Arrangement or mounting of linings for fire-boxes, e.g. fire-back	F24B 13/02 and subgroups
Shaft or vertical furnaces in general	F27B 1/00 and subgroups
Measuring steady or quasi-steady pressure of a fluid or a fluent solid material by electric or magnetic pressure-sensitive elements. Transmitting or indicating the displacement of mechanical pressure-sensitive elements, used to measure the steady or quasi-steady pressure of a fluid or fluent solid material by electric or magnetic means using a ceramic diaphragm, e.g. alumina, fused quartz, glass	G01L 9/0075
Ceramics; Glasses; Refractories as protection against x-radiation, gamma radiation, corpuscular radiation or particle bombardment	G21F 1/06, G21F 1/06
Materials for conductors or conductive bodies	H01B 1/00 and subgroups
Materials for insulators or insulating or dielectric bodies	H01B 3/00 and subgroups
Superconductive or hyperconductive conductors, cables, or transmission lines	H01B 12/00 and subgroups
Materials for varistor cores	H01C 7/105 and subgroups
Materials for magnets or magnetic bodies	H01F 1/00 and subgroups
Superconducting magnets or coils	H01F 6/00 and subgroups
Materials for fixed capacitors, e.g. ceramic dielectrics	H01G 4/12 and subgroups
Details of semiconductor or other solid state devices characterised by the material , e.g. ceramic substrates	H01L 23/00 and subgroups
Ceramic substrates for microelectronic semi-conductors	H01L 23/15
Details of semiconductor or other solid state devices characterised by the material , encapsulations, e.g. encapsulating layers, coatings, characterised by the material, Oxides or nitrides or carbides, e.g. ceramics, glass	H01L 23/291
Materials for superconductive or hyperconductive devices	H01L 39/00 and subgroups

Materials for piezo-electric or electrostrictive elements	H01L 41/00 and subgroups
Materials for inert electrodes with catalytic activity for electrochemical generators, e.g. for fuel cells	H01M 4/86 and subgroups
Fuel cells containing glass or ceramic materials	H01M 8/0215 and subgroups
Materials for solid electrolytes of fuel cells	H01M 8/10 and subgroups
Dielectric resonators of the waveguide type	H01P 7/10 and subgroups
Diaphragms comprising ceramic-like materials, e.g. pure ceramic, glass, boride, nitride, carbide, mica and carbon materials	H04R 2307/023
Heater elements characterised by the composition or nature of the materials or by the arrangement of the conductor: conductive ceramics, e.g. metal oxides, metal carbides, barium titanate, ferrites, zirconia, vitreous compounds	H05B 3/141 and subgroup

Special rules of classification

In this group, in the absence of an indication to the contrary, compositions are classified according to the constituent present in the highest proportion by weight.

In this group, magnesium is considered as an alkaline earth metal.

In this group, a composite is considered as a sintered mixture of different powdered materials, other than sintering aids, the materials being present as separate phases in the sintered product.

In this group, fine ceramics are considered as products having a polycrystalline fine-grained microstructure, e.g. of dimensions below 100 micrometers.

The production of ceramic powder is classified in this group in so far as it relates to the preparation of powder with specific characteristics. If the powder is used for making a sintered ceramic, it is classified in C04B 35/00, e.g. making alumina powder that is used for a sintered alumina ceramic. If the composition of powder is new, the preparation of the powder is classified as well, irrespective of whether a sintered ceramic is made, e.g. the preparation of a barium titanate powder with a new composition that is used as filler in polymers is still classified in C04B 35/00. A new method for making an already known ceramic powder that is not used for making a sintered ceramic is not classified in C04B 35/00, but in C01 or C09, e.g. a new method for making alumina powder that is used for abrasives or as polymer filler is not classified in C0B35.

Any ingredient of a refractory mortar composition containing a hydraulic cement , e.g. aluminous cement , classified in C04B 35/66, which is considered to represent information of interest for search, may also be classified according to the Last Place Rule of note (2) after the subclass title of C04B, in groups C04B 7/00 - C04B 24/00. This can for example be the case when it is considered of interest to enable searching of compositions using a combination of classification symbols. Such non-obligatory classification should be given as "additional information". For example, such an additional classification in group C04B 24/00 may be given for an organic retarder added to the refractory mortar composition.

The symbols from C04B 2235/00 are usable for all documents classified in C04B 35/00 (as well as for C04B 33/00, C04B 37/00 and B32B 18/00). The symbols from C04B 2235/00 indicate additional information regarding additives used in the starting mixture, methods for making green bodies, aspects relating to the heat treatments that are given, secondary phases present in the final product, physical aspects of the final product and properties of the final product.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Ceramics	Inorganic, non metallic products obtained by a process involving a shaping step and a sintering or comparable heat treatment step, with the exclusion of cements, cermets and glasses, glazes, vitreous enamels and devitrified glass ceramics.
Fine ceramics	Ceramics having a polycrystalline fine-grained microstructure, e.g. of dimensions below 100 micrometer.
Glass-ceramic	having a crystalline phase dispersed in a glassy phase and constituting at least 50% by weight of the total composition
Refractories	Ceramics or mortars withstanding high temperatures of at least about 1500 degrees C. For classification and search in this subclass no substantial distinction is made between the terms “refractories” and “ceramics ".
Carbon-carbon composites	Products consisting of carbon fibres in a carbon matrix are usually referred to as “carbon-carbon composites ".
Porous materials	Materials which are deliberately made porous, e.g. by adding gas- forming, foaming, burnable or lightweight additives to the composition they are made of.

C04B 35/01

based on oxide ceramics

Definition statement

This place covers:

All oxide ceramics that are not classified in one of the sub-groups. These are for instance oxides based on gallium, indium, thallium, cobalt, nickel, noble metals, antimony, germanium, e.g. cobaltates, germanates, antimonates.

References

Limiting references

This place does not cover:

Oxide ceramics containing a metallic binder	C22C 29/12

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating ceramic substrates with oxide ceramic material	C04B 41/5027, C04B 41/5072
Metal oxides, mixed metal oxides or oxide forming salts thereof, e.g. carbonates, nitrates, (oxy)hydroxides, chlorides, as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/32 and subgroups
Gallium oxides, gallates, indium oxides, indates, thallium oxides, thallates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. zinc gallate ($ZnGa_2O_4$)	C04B 2235/3286

Germanium oxides, germanates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. copper germanate ($CuGeO_3$)	C04B 2235/3287
Noble metal oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. IrO_2, PdO, RhO_2	C04B 2235/3289 and subgroup
Antimony oxides, antimonates, antimonites or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, indium antimonate ($InSbO_4$)	C04B 2235/3294
Bismuth oxides, bismuthates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. zinc bismuthate ($Zn(BiO_3)_2$)	C04B 2235/3298
Non-metal oxides, mixed non-metal oxides or oxide forming salts thereof, e.g. carbonates, nitrates, (oxy)hydroxides, chlorides, as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/34 and subgroups
Boron oxide or borate as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3409
Oxide interlayer used for joining a ceramic with another substrate	C04B 2237/06 and subgroups
Oxide substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/34 and subgroups
Materials for prostheses based on metal oxides	A61L 27/10 and subgroups
Oxide ceramic membranes	B01D 71/024 and subgroups
The preparation of gallium, indium or thallium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 15/00 and subgroups
The preparation of antimony compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 30/00 and subgroups
The preparation of cobalt compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 51/00 and subgroups
The preparation of nickel compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 53/00 and subgroups
The preparation of ruthenium, rhodium, palladium, osmium, iridium, or platinum compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 55/00 and subgroups
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: compounds of antimony	C09C 1/0096, C09C 1/0096
Luminescent, e.g. electroluminescent, chemiluminescent materials containing germanates	C09K 11/0844
Luminescent, e.g. electroluminescent, chemiluminescent materials containing antimonates	C09K 11/0894
Luminescent, e.g. electroluminescent, chemiluminescent materials containing iron, nickel and cobalt	C09K 11/60 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing gallium, indium or thallium	C09K 11/62 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing germanium, tin or lead	C09K 11/66 and subgroups

Luminescent, e.g. electroluminescent, chemiluminescent materials containing arsenic, antimony or bismuth	C09K 11/74 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing arsenic, antimony or bismuth germanates	C09K 11/745
Luminescent, e.g. electroluminescent, chemiluminescent materials containing rare earth germinates	C09K 11/7707, C09K 11/7735, C09K 11/775, C09K 11/7775, C09K 11/7793
Luminescent, e.g. electroluminescent, chemiluminescent materials containing rare earth antimonates; arsenates	C09K 11/7714, C09K 11/7742, C09K 11/7782, C09K 11/7798
Oxide single crystals	C30B 29/16 and subgroups
Non-adjustable resistors formed as one or more layers or coatings; Non-adjustable resistors made from powdered conducting material or powdered semi-conducting material with or without insulating material having negative temperature coefficient mainly consisting oxides	H01C 7/043 and subgroups
Light-sensitive devices comprising an oxide semiconductor electrode	H01G 9/2027
Forming inorganic semiconducting materials on a substrate, the substrate being an oxide	H01L 21/02403, H01L 21/02414
Electrodes for accumulators with non-aqueous electrolyte, e.g. for lithium-accumulators; Processes of manufacture thereof: based on mixed oxides or hydroxides, or on mixtures of oxides or hydroxides, e.g. LiCoOx	H01M 4/131, H01M 4/1391
Fuel cells operating at high temperature, e.g. with stabilised ZrO_2 electrolyte, Electrode material consisting of oxides	H01M 4/9025, and subgroup
Fuel cells operating at high temperature, e.g. with stabilised ZrO_2 electrolyte, the electrolyte consisting of oxides	H01M 8/1246 and subgroups

Special rules of classification

Classification occurs by identifying which phase of the final product is present in the largest amount. This does not necessarily need to be more than 50%, you could also have 40% A, 35% B and 25% C. If there are two or more phases present in the same amount as the largest amount, all phases are classified, thus with 30% A, 30% B, 30% C and 10% D the phases A, B and C are all three classified. For example, a final product containing 50% zirconia and 50% alumina receives the classes C04B 35/119 (alumina reinforced with zirconia) and C04B 35/4885 (zirconia reinforced with alumina).

The alkali metal oxides, alkaline earth metal oxides and rare earth oxides form many different mixed oxides with other metal oxides. If alkali metal oxides, alkaline earth metal oxides and rare earth oxides are present in a mixed oxide with another metal oxide, the other metal oxide is almost always determining the classification.

The symbols from C04B 2235/00 are usable for all documents classified in C04B 35/00 (as well as for C04B 33/00, C04B 37/00 and B32B 18/00). The symbols from C04B 2235/00 indicate additional information regarding additives used in the starting mixture, methods for making green bodies, aspects relating to the heat treatments that are given, secondary phases present in the final product, physical aspects of the final product and properties of the final product.

C04B 35/013

{containing carbon (C04B 35/103 takes precedence)}

Definition statement

This place covers:

Oxide ceramics containing carbon products, e.g. oxide refractories containing a carbon binder such as pitch, tar, bitumen (materials which are classified in C04B 35/63496), or oxide materials containing graphite, diamond or carbon black additives.

References

Limiting references

This place does not cover:

Alumina-based refractories containing carbon	C04B 35/103

Informative references

Attention is drawn to the following places, which may be of interest for search:

Bituminous additives for ceramic materials, e.g. tar, pitch	C04B 35/63496
Carbon as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/422 and subgroups
Organic compounds becoming part of a ceramic after heat treatment, e.g. carbonising phenol resins	C04B 2235/48 and subgroups

Special rules of classification

If the carbon additive is tar or pitch, C04B 35/63496 is given as well. The carbonaceous additives are further indicated with the symbols C04B 2235/424 (carbon black), C04B 2235/425 (graphite) and C04B 2235/427 (diamond). In the case polymeric additives from the classes C04B 35/63404 and subgroups, C04B 35/63448 and subgroups and C04B 35/63492 are added to an oxide ceramic mixture and are carbonised, C04B 2235/48 is given, but C04B 35/013 not.

C04B 35/016

{based on manganites}

Definition statement

This place covers:

All ceramics or ceramic mixtures based on manganese oxide and all manganites and manganates, e.g. perovskites such as lanthanum manganate $LaMnO_3$

References

Limiting references

This place does not cover:

Mixed oxides containing more of other transition metal oxides, e.g. $LaCo_{0.6}Mn_{0.4}O_3$	C04B 35/01 (for the cobaltate), C04B 2235/3227 (for the La), C04B 2235/3262 (for the Mn), C04B 2235/768 (for the perovskite structure)
Mixed oxides containing more of group 13-15 metal oxides, e.g. $BaAl_{0.6}Mn_{0.4}O_3$	C04B 35/44 (for the aluminate), C04B 2235/3215 (for the Ba), C04B 2235/3262 (for the Mn), C04B 2235/768 (for the perovskite structure)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating ceramic substrates with manganates	C04B 41/5028
Manganese or rhenium oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. MnO	C04B 2235/3262 and subgroups
The preparation of manganese compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 45/00 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing manganese or rhenium	C09K 11/57 and subgroups
Electrolytic production of manganese oxides	C25B 1/21
Electrolytic production of electrodes based on manganese dioxide or lead dioxide	C25B 11/16
Manganite magnets	H01F 1/0317, H01F 1/0317
Diluted non-magnetic ions in a magnetic cation-sublattice, e.g. $La_{1-x}(Ba,Sr)xMnO_3$	H01F 1/407, H01F 1/407
Electrodes for fuel cells and batteries composed of or comprising active material of manganese oxides or hydroxides	H01M 4/50, H01M 4/50 and subgroups
Fuel cells applied on a support operating at high temperature, the electrode being of complexed oxides, optionally doped, of the type $M1MeO_3$, M1 being an alkaline earth metal or a rare earth, Me being a metal, e.g. perovskites, with the anode and the cathode in the form of gas diffusion electrodes	H01M 4/9033

C04B 35/03

based on magnesium oxide, calcium oxide or oxide mixtures derived from dolomite

Definition statement

This place covers:

Oxides based on single oxide phases of MgO or CaO or mixed oxides of MgO and CaO, or mixed oxides of alkaline earth oxides with either alkali metal oxides and/or rare earth oxides, in which the alkaline earth metal oxide forms the largest fraction. Mixed oxides of magnesia/calcia with zirconium oxide, in which the amount of magnesia/calcia is larger than the amount of zirconia, e.g. $Mg_{0.6}Zr_{0.4}O_x$

References

Limiting references

This place does not cover:

Mixed oxides of MgO and/or CaO with both alumina and silica, e.g. cordierite	C04B 35/195
Mixed oxides of MgO with silica without alumina, e.g. forsterite (Mg_2SiO_4)	C04B 35/20
Mixed oxides of CaO with silica without alumina, e.g. wollastonite ($CaSiO_4$)	C04B 35/22
Mixed oxides of MgO and/or CaO with iron oxides and possible other metal oxides, e.g. ferrites	C04B 35/2608 and subgroups, C04B 35/2683
Mixed oxides of MgO and/or CaO with chromium oxide, e.g. chromites	C04B 35/42
Mixed oxides of CaO with alumina, without silica, e.g. calcium aluminate	C04B 35/44
Mixed oxides of MgO with alumina, without silica, e.g. magnesium aluminate, spinel	C04B 35/443
Magnesium or calcium based phosphates	C04B 35/447
Mixed oxides of MgO and/or CaO with copper oxide, e.g. cuprates	C04B 35/45 and subgroups
Mixed oxides of MgO and/or CaO with zinc oxide and/or bismuth oxide, e.g. magnesium bismuthate	C04B 35/453
Mixed oxides of MgO and/or CaO with tin oxide, e.g. magnesium stannate	C04B 35/457
Mixed oxides of MgO and/or CaO with titanium oxides, such as magnesium titanate or calcium titanate	C04B 35/465
Mixed oxides of MgO and/or CaO with zirconium oxide, e.g. magnesium zirconate, containing more Zr than Mg and Ca	C04B 35/48 and subgroups
Mixed oxides of MgO and/or CaO with zirconium oxide and titanium oxide, e.g. calcium titanate zirconate ($CaTi_{0.5}Zr_{0.5}O_3$)	C04B 35/49 and subgroups
Mixed oxides of MgO and/or CaO with vanadium oxide and/or niobium oxide and/or molybdenum oxide and/or tungsten oxide and/or tantalum oxide, e.g. magnesium tantalum niobate ($MgNb_{0.5}Ta_{0.5}O_3$)	C04B 35/495 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Obtaining lime, magnesia or dolomite	C04B 2/00 and subgroups
Alkaline earth oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. BeO	C04B 2235/3205 and subgroups
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: compounds of alkaline earth metals or magnesium	C09C 1/02, C09C 1/02 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing inorganic alkaline earth metal compounds	C09K 11/0816, C09K 11/55

C04B 35/04

based on magnesium oxide

Definition statement

This place covers:

Oxides based on single oxide phases of MgO, or mixed oxides of MgO with either alkali metal oxides and/or rare earth oxides, in which the MgO forms the largest fraction

References

Limiting references

This place does not cover:

Mixed oxides of MgO with both alumina and silica, e.g. cordierite	C04B 35/195
Mixed oxides of MgO with silica without alumina, e.g. forsterite (Mg_2SiO_4)	C04B 35/20
Mixed oxides of MgO with iron oxides and possible other metal oxides, e.g. ferrites	C04B 35/2608 and subgroups, C04B 35/2683
Mixed oxides of MgO with chromium oxide, e.g. chromites	C04B 35/42
Mixed oxides of MgO with alumina, without silica, e.g. magnesium aluminate, spinel	C04B 35/443
Magnesium based phosphates	C04B 35/447
Mixed oxides of MgO with copper oxide, e.g. cuprates	C04B 35/45 and subgroups
Mixed oxides of MgO with zinc oxide and/or bismuth oxide, e.g. magnesium bismuthate	C04B 35/453
Mixed oxides of MgO with tin oxide, e.g. magnesium stannate	C04B 35/457
Mixed oxides of MgO with titanium oxides, such as magnesium titanate	C04B 35/465
Mixed oxides of MgO with zirconium oxide, e.g. magnesium zirconate	C04B 35/48 and subgroups
Mixed oxides of MgO with zirconium oxide and titanium oxide, e.g. magnesium titanate zirconate ($MgTi_{0.5}Zr_{0.5}O_3$)	C04B 35/49 and subgroups
Mixed oxides of MgO with vanadium oxide and/or niobium oxide and/ or molybdenum oxide and/or tungsten oxide and/or tantalum oxide, e.g. magnesium tantalum niobate ($MgNb_{0.5}Ta_{0.5}O_3$)	C04B 35/495 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: magnesia	C04B 14/304
Use of inorganic materials as active ingredients for mortars, concrete or artificial stone: magnesia; magnesium hydroxide	C04B 22/066
Magnesium oxide or magnesium carbonate cements	C04B 28/105, C04B 28/30 and subgroup
Making fibres based on magnesium oxide	C04B 35/62263
Coating or impregnating ceramic substrates with magnesium oxide	C04B 41/5029, C04B 41/5084 (cementitious)
Magnesium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3206
Materials for prostheses based on magnesia or magnesium oxide	A61F 2310/00197
Catalysts comprising the elements, oxides, or hydroxides of magnesium	B01J 21/10, B01J 21/10, C07C 2521/10
Preparation of magnesium compound powders, e.g. magnesium oxide powder	C01F 5/00 and subgroups
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: compounds containing only magnesium as metal	C09C 1/028, C09C 1/028

C04B 35/043

Refractories from grain sized mixtures

Definition statement

This place covers:

MgO based refractories having large grains, the majority larger than 100 microns

References

Limiting references

This place does not cover:

MgO ceramics with the majority of the grain smaller than 100 microns	C04B 35/053

Informative references

Attention is drawn to the following places, which may be of interest for search:

Grain-sized alumina-based refractories	C04B 35/101 and subgroups
Grain-sized titania-based refractories	C04B 35/46 and C04B 35/66

Grain-sized zirconia-based refractories	C04B 35/482
Grain-sized silicon carbide-based refractories	C04B 35/565 and subgroups, and **C04B45/66**
Monolithic refractories and refractory mortars	C04B 35/66
Using particles larger than 100 microns for making the ceramic	C04B 2235/5427
Bimodal, multi-modal or multi-fraction particle size distribution	C04B 2235/5472
Compositions of refractory mould or core materials; Grain structures thereof	B22C 1/00 and subgroups

C04B 35/0435

{containing refractory metal compounds other than chromium oxide or chrome ore}

Definition statement

This place covers:

The majority of the refractory material is MgO, a minority a refractory metal oxide such alumina, zirconia, titania, or a refractory metal non-oxide such as a carbide or boride

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Aluminium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. bauxite, alpha-alumina	C04B 2235/3217 and subgroups
Titanium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. rutile or anatase	C04B 2235/3232 and subgroups
Zirconium or hafnium oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. HfO_2	C04B 2235/3244 and subgroups
Borides as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3804 and subgroups
Carbides as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3817 and subgroups

C04B 35/047

containing chromium oxide or chrome ore

Definition statement

This place covers:

The refractory contains some type of chromium oxide

References

Limiting references

This place does not cover:

Fused magnesia refractories containing chromium oxide or chrome ore	C04B 35/051
Grain-sized alumina-based refractories containing chromium oxide or chromium ore	C04B 35/105

Informative references

Attention is drawn to the following places, which may be of interest for search:

Chromium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Cr_2O_3	C04B 2235/3241 and subgroup

C04B 35/0473

{obtained from fused grains}

Definition statement

This place covers:

Both refractories that are used directly after melting, either in particle or bulk form, as well as fused refractory that is sintered before use as refractory

References

Limiting references

This place does not cover:

Complete fusion of the magnesia refractory without subsequent heat treatment	C04B 35/05

Informative references

Attention is drawn to the following places, which may be of interest for search:

Fusing to make ceramic particles in general	C04B 35/62665

C04B 35/0476

{obtained from prereacted sintered grains ("simultaneous sinter")}

Definition statement

This place covers:

The refractory mixture has been sintered before use

C04B 35/05

Refractories by fusion casting

Definition statement

This place covers:

The magnesia-based refractory has been melted

References

Limiting references

This place does not cover:

Magnesia-based refractory that has been melted and subsequently sintered	C04B 35/0473

Informative references

Attention is drawn to the following places, which may be of interest for search:

Clay wares made by methods involving melting, fusion or softening	C04B 33/323
Alumina-based refractories made by fusion casting	C04B 35/107 and subgroup
Zirconia-based refractories made by fusion casting	C04B 35/484
Fusing to make ceramic particles in general	C04B 35/62665
Refractories in general made by fusion casting	C04B 35/657
Heat treatments such as] Calcining; Fusing Pyrolysis in general	B01J 6/00 and subgroups

C04B 35/051

{containing chromium oxide or chrome ore}

Definition statement

This place covers:

Melted MgO based refractory containing also chromium oxide

References

Limiting references

This place does not cover:

Magnesia-based refractory containing chromium oxide or chrome ore that has been melted and subsequently sintered	C04B 35/0476
Grain-sized alumina-based refractories containing chromium oxide or chromium ore	C04B 35/105

Informative references

Attention is drawn to the following places, which may be of interest for search:

Chromium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Cr_2O_3	C04B 2235/3241 and subgroup

C04B 35/053

Fine ceramics

Definition statement

This place covers:

MgO-based ceramics having a majority of grains with a size of below 100 microns. Oxides based on single oxide phases of MgO, or mixed oxides of MgO with either alkali metal oxides and/or rare earth oxides, in which the MgO forms the largest fraction.

References

Limiting references

This place does not cover:

Mixed oxides of MgO with both alumina and silica, e.g. cordierite	C04B 35/195
Mixed oxides of MgO with silica without alumina, e.g. forsterite (Mg_2SiO_4)	C04B 35/20
Mixed oxides of MgO with iron oxides and possible other metal oxides, e.g. ferrites	C04B 35/2608 and subgroups, C04B 35/2683
Mixed oxides of MgO with chromium oxide, e.g. chromites	C04B 35/42
Mixed oxides of MgO with alumina, without silica, e.g. magnesium aluminate, spinel	C04B 35/443
Magnesium based phosphates	C04B 35/447
Mixed oxides of MgO with copper oxide, e.g. cuprates	C04B 35/45 and subgroups
Mixed oxides of MgO with zinc oxide and/or bismuth oxide, e.g. magnesium bismuthate	C04B 35/453
Mixed oxides of MgO with tin oxide, e.g. magnesium stannate	C04B 35/457
Mixed oxides of MgO with titanium oxides, such as magnesium titanate	C04B 35/465
Mixed oxides of MgO with zirconium oxide, e.g. magnesium zirconate	C04B 35/48 and subgroups
Mixed oxides of MgO with zirconium oxide and titanium oxide, e.g. magnesium titanate zirconate ($MgTi_{0.5}Zr_{0.5}O_3$)	C04B 35/49 and subgroups
Mixed oxides of MgO with vanadium oxide and/or niobium oxide and/ or molybdenum oxide and/or tungsten oxide and/or tantalum oxide, e.g. magnesium tantalum niobate ($MgNb_{0.5}Ta_{0.5}O_3$)	C04B 35/495 and subgroups
Using particles of size 1-100 microns for making a ceramic	C04B 2235/5436

C04B 35/057

based on calcium oxide

Definition statement

This place covers:

Oxides based on single oxide phases of CaO, or mixed oxides of MgO with either alkali metal oxides and/or rare earth oxides, in which the CaO forms the largest fraction. The ceramic can have all grain sizes.

References

Limiting references

This place does not cover:

Mixed oxides of CaO with both alumina and silica, e.g. cordierite	C04B 35/195
Mixed oxides of CaO with silica without alumina, e.g. wollastonite ($CaSiO_4$)	C04B 35/22
Mixed oxides of CaO with iron oxides and possible other metal oxides, e.g. ferrites	C04B 35/2608 and subgroups, C04B 35/2683
Mixed oxides of CaO with chromium oxide, e.g. chromites	C04B 35/42
Mixed oxides of CaO with alumina, without silica, e.g. calcium aluminate	C04B 35/44
Calcium based phosphates	C04B 35/447
Mixed oxides of CaO with copper oxide, e.g. cuprates	C04B 35/45 and subgroups
Mixed oxides of CaO with zinc oxide and/or bismuth oxide, e.g. calcium bismuthate	C04B 35/453
Mixed oxides of CaO with tin oxide, e.g. calcium stannate	C04B 35/457
Mixed oxides of CaO with titanium oxides, such as calcium titanate	C04B 35/465
Mixed oxides of CaO with zirconium oxide, e.g. calcium zirconate	C04B 35/48 and subgroups
Mixed oxides of CaO with zirconium oxide and titanium oxide, e.g. calcium titanate zirconate ($CaTi_{0.5}Zr_{0.5}O_3$)	C04B 35/49 and subgroups
Mixed oxides of CaO with vanadium oxide and/or niobium oxide and/ or molybdenum oxide and/or tungsten oxide and/or tantalum oxide, e.g. calcium tantalum niobate ($CaNb_{0.5}Ta_{0.5}O_3$)	C04B 35/495 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Hydraulic lime	C04B 28/12
Eliminating lime or iron from clay mixtures	C04B 33/10
Calcium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. lime	C04B 2235/3208 and subgroups
Materials for prostheses based on calcia or calcium oxide CaO	A61F 2310/00221
The preparation of compounds of calcium, barium and strontium in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01F 11/00 and subgroups
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: calcium carbonates	C09C 1/021, C09C 1/021 and subgroups
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: calcium sulphates	C09C 1/025, C09C 1/025

C04B 35/06

based on oxide mixtures derived from dolomite

Definition statement

This place covers:

mixtures of CaO and MgO

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Magnesium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3206
Calcium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. lime	C04B 2235/3208 and subgroups
Dolomite, i.e. mixed calcium magnesium carbonate, or oxides derived from dolomite as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/321
Carbonates (CO_3^{2-}) as starting material for making ceramics or present as secondary phase in the sintered ceramic	C04B 2235/442

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Dolomite	$(CaMg)(CO_3)_2$

C04B 35/08

based on beryllium oxide

Definition statement

This place covers:

Oxide ceramics based on the single oxide phase of BeO.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Alkaline earth oxides or salts as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3205 and subgroups
Preparation of beryllium compound powders, e.g. beryllium oxide powder	C01F 3/00 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing beryllium compounds	C09K 11/55

C04B 35/10

based on aluminium oxide

Definition statement

This place covers:

Ceramics or ceramic mixtures containing as the largest fraction the single oxide Al_2O_3

References

Limiting references

This place does not cover:

Ceramics containing as the largest fraction a mixed oxide of alumina with silica	C04B 33/00 (clay ceramics) or C04B 35/18 and subgroups (alumino-silicate ceramics)
Ceramics containing as the largest fraction a mixed oxide of alumina with other metal oxides	C04B 35/44 (aluminates)
Ceramics containing as the largest fraction a mixed oxide of alumina with magnesia	C04B 35/443 (magnesia-alumina spinel)
Alumina containing a metallic binder, e.g. an alumina cermet with Al binder	C22C 29/12

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: alumina	C04B 14/303
Making fibres based on aluminium oxide	C04B 35/62236
Coating or impregnating ceramic substrates with alumina	C04B 41/5031
Aluminium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. bauxite, alpha-alumina	C04B 2235/3217 and subgroups
Alumina or aluminate interlayer used for joining a ceramic with another substrate	C04B 2237/064
Alumina or aluminate substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/343
Materials for prostheses or coatings of prostheses based on aluminium oxides	A61L 27/105
Materials for prostheses based on aluminium oxides	A61L 27/105 and subgroups
Alumina-based membranes	B01D 71/025, B01D 71/025
Catalysts comprising alumina	B01J 21/04, B01J 21/04, C07C 2521/04

Preparation of aluminium compound powders, e.g. aluminium oxide powder	C01F 7/00 and subgroups
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: compounds of aluminium	C09C 1/40, C09C 1/40 and subgroups
Abrasives	C09K 3/14
Luminescent, e.g. electroluminescent, chemiluminescent materials containing aluminium	C09K 11/64 and subgroups
Alumina single crystals	C30B 29/20
Aluminium oxide in machines or engines in general (F01) or machines for liquids (F04)	F05C 2203/0869 and subgroup
Materials for vessels of gas- or vapour discharge lamps	H01J 61/30
Manufacture or treatment of semiconductor devices or of parts thereof: forming insulating materials on a substrate, the material containing aluminium, e.g. Al_2O_3	H01L 21/02178, H01L 21/02178

C04B 35/101

Refractories from grain sized mixtures

Definition statement

This place covers:

Alumina based refractories having large grains, the majority larger than 100 microns

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Grain-sized magnesia-based refractories	C04B 35/043 and subgroups
Grain-sized titania-based refractories	C04B 35/46 and C04B 35/66
Grain-sized zirconia-based refractories	C04B 35/482
Grain-sized silicon carbide-based refractories	C04B 35/565 and subgroups, and **C04B45/66**
Monolithic refractories and refractory mortars	C04B 35/66
Using particles larger than 100 microns for making the ceramic	C04B 2235/5427
Bimodal, multi-modal or multi-fraction particle size distribution	C04B 2235/5472
Compositions of refractory mould or core materials; Grain structures thereof	B22C 1/00 and subgroups
Abrasive particles per se obtained by division of a mass agglomerated by sintering	C09K 3/1418

C04B 35/1015

{containing refractory metal compounds other than those covered by C04B 35/103 - C04B 35/106}

Definition statement

This place covers:

Refractories based on alumina containing other oxide refractories such as magnesia, titania

References

Limiting references

This place does not cover:

Grain-sized alumina-based refractories containing carbon	C04B 35/103
Grain-sized alumina-based refractories containing chromium oxide or chromium ore	C04B 35/105
Grain-sized refractory mixtures based on alumina containing zirconia	C04B 35/106

Informative references

Attention is drawn to the following places, which may be of interest for search:

Magnesium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3206
Aluminium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. bauxite, alpha-alumina	C04B 2235/3217 and subgroups
Titanium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. rutile or anatase	C04B 2235/3232 and subgroups

C04B 35/103

containing non-oxide refractory materials, e.g. carbon (C04B 35/106 takes precedence)

Definition statement

This place covers:

Shaped alumina-based refractory ceramics or alumina-based refractory mixtures, containing non-oxides such as carbon, pitch, tar, carbides, nitrides, borides, silicides, fluorides, sulphides, any material that would be classified in C04B 35/515-C04B 35/597.

References

Limiting references

This place does not cover:

Grain-sized refractory mixtures based on alumina containing zirconia	C04B 35/106

Shaped alumina-based refractory ceramics or alumina-based refractory mixtures containing polymers such as polymeric binders	C04B 35/63404 and subgroups, C04B 35/63448 and subgroups and C04B 35/63492 and C04B 35/636 and subgroup
Shaped alumina-based refractory ceramics or alumina-based refractory mixtures containing non-oxide fibers or non-oxide whiskers	C04B 35/803 and C04B 2235/524 and subgroups
Shaped alumina-based refractory ceramics or alumina-based refractory mixtures containing carbon nanotubes	C04B 35/803 and C04B 2235/5288
Shaped alumina-based refractory ceramics or alumina-based refractory mixtures containing carbon as an impurity	C04B 2235/721

Informative references

Attention is drawn to the following places, which may be of interest for search:

Oxide-based ceramics or ceramic mixtures in general containing carbon	C04B 35/013
Non-oxide based ceramics	C04B 35/515 and subgroups
Ceramic powders coated with non-oxide ceramic materials	C04B 35/62828 and subgroups
Ceramic fibers coated with non-oxide ceramic materials	C04B 35/62857 and subgroups
Non-oxide additives for ceramics	C04B 2235/38 and subgroups
Carbon additives for ceramics	C04B 2235/422 and subgroups
Organic compounds becoming part of a ceramic after heat-treatment, e.g. phenol resins	C04B 2235/48 and subgroups
Fibrous non-oxide additives for ceramics	C04B 2235/524
Carbon nanotube additives for ceramics	C04B 2235/5288

Special rules of classification

If the carbon additive is tar or pitch, C04B 35/63496 is given as well. The carbonaceous additives are further indicated with the codes C04B 2235/424 (carbon black), C04B 2235/425 (graphite) and C04B 2235/427 (diamond). Other non-oxide additives, such as silicon carbide or silicon nitride, are indicated with a symbol from C04B 2235/48. In the case polymeric additives from the classes C04B 35/63404 and subgroups, C04B 35/63448 and subgroups and C04B 35/63492 are added to an oxide ceramic mixture and are carbonised, C04B 2235/48 is given, but C04B 35/013 not.

C04B 35/105

containing chromium oxide or chrome ore

Definition statement

This place covers:

Refractories based on alumina, containing also chromium oxide

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Grain-sized refractory mixtures based on magnesia containing chromium oxide or chrome ore	C04B 35/047 and subgroups
Chromium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Cr_2O_3	C04B 2235/3241 and subgroup

C04B 35/106

containing zirconium oxide or zircon ($ZrSiO_4$)

Definition statement

This place covers:

Refractories based on alumina, containing also zirconium oxide, possibly also containing silicon oxide

References

Limiting references

This place does not cover:

Alumina refractories containing zirconia, made by melt-casting	C04B 35/109

Informative references

Attention is drawn to the following places, which may be of interest for search:

Fine alumina ceramics containing zirconia	C04B 35/119
Zirconium or hafnium oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. HfO_2	C04B 2235/3244 and subgroups
Zirconates or hafnates as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. zircon ($ZrSiO_4$)	C04B 2235/3248

C04B 35/107

Refractories by fusion casting

Definition statement

This place covers:

Both refractories that are used directly after melting, either in particle or bulk form, as well as fused refractory that is sintered before use as refractory

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Clay wares made by methods involving melting, fusion or softening	C04B 33/323

Magnesia-based refractories made by fusion casting	C04B 35/05 and subgroup
Zirconia-based refractories made by fusion casting	C04B 35/484
Fusing to make ceramic particles in general	C04B 35/62665
Refractories in general made by fusion casting	C04B 35/657
Heat treatments such as] Calcining; Fusing Pyrolysis in general	B01J 6/00 and subgroups
Abrasive particles per se obtained by division of a mass agglomerated by melting, at least partially, e.g. with a binder	C09K 3/1427

C04B 35/109

containing zirconium oxide or zircon ($ZrSiO_4$)

Definition statement

This place covers:

Refractories based on alumina, made by melting, containing also zirconium oxide, possibly also containing silicon oxide

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Grain-sized refractory mixtures based on alumina containing zirconia	C04B 35/106
Fine alumina ceramics containing zirconia	C04B 35/119
Zirconates or hafnates as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. zircon ($ZrSiO_4$)	C04B 2235/3248

C04B 35/111

Fine ceramics

Definition statement

This place covers:

Ceramics or ceramic mixtures having as the largest fraction alumina single phase material having an average grain size of below 100 microns

References

Limiting references

This place does not cover:

Ceramics containing as the largest fraction a mixed oxide of alumina with silica	C04B 33/00 (clay ceramics) or C04B 35/18 and subgroups (alumino-silicate ceramics)
Ceramics containing as the largest fraction a mixed oxide of alumina with other metal oxides	C04B 35/44 (aluminates)

Ceramics containing as the largest fraction a mixed oxide of alumina with magnesia	C04B 35/443 (magnesia-alumina spinel)
Alumina containing a metallic binder, e.g. an alumina cermet with Al binder	C22C 29/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics or ceramic mixtures having as the largest fraction alumina single phase material having an average grain size of above 100 microns	C04B 35/101 and subgroups
Using particles of size 1-100 microns for making the ceramic	C04B 2235/5436

C04B 35/1115

{Minute sintered entities, e.g. sintered abrasive grains or shaped particles such as platelets (abrasives C09K 3/14)}

Definition statement

This place covers:

Mainly alumina particles that are bonded together into aggregates and used as abrasive

References

Limiting references

This place does not cover:

Bulk alumina objects	C04B 35/111

Informative references

Attention is drawn to the following places, which may be of interest for search:

Powdery starting material for making ceramics containing flakes, platelets or plates	C04B 2235/5292
Abrasive particles per se obtained by division of a mass agglomerated by sintering	C09K 3/1418

C04B 35/113

based on beta-aluminium oxide

Definition statement

This place covers:

Ceramics or ceramic mixtures based on alumina(te) phases with the composition $MAl_{11}O_{18}$ or $LnAl_{12}O_{19}$

References

Limiting references

This place does not cover:

Other aluminates	C04B 35/44 or C04B 35/443 (spinel)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Aluminates other than alumino-silicates as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. spinel ($MgAl_2O_4$)	C04B 2235/3222
Rare earth oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Sc_2O_3, Lu_2O_3, Nd_2O_3	C04B 2235/3224
Preparation of beta-alumina powders	C01F 7/028

C04B 35/115

Translucent or transparant products

Definition statement

This place covers:

Sintered alumina ceramics that are translucent or transparent

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramic materials other than alumina that are transparent or translucent	C04B 2235/9653

C04B 35/117

Composites

Definition statement

This place covers:

All sintered alumina ceramics that contain at least one secondary phase, where this secondary phase is neither a grain boundary phase nor a different type of alumina phase. The main phase can be for instance alpha-alumina, the secondary phase an aluminate.

References

Limiting references

This place does not cover:

Alumina refractories containing a secondary phase	C04B 35/1015-C04B 35/106, C04B 35/109

Alumina ceramics containing a mixture of different alumina phases, e.g. alpha-alumina and beta-alumina	C04B 35/111, C04B 35/113, C04B 35/115

Informative references

Attention is drawn to the following places, which may be of interest for search:

Alumina ceramics containing shaped metallic materials, e.g. metallic fibers	C04B 35/74 and subgroup
Alumina ceramics containing ceramic fibers, whiskers or platelets, e.g. an alumina particle matrix containing alumina fibers or alumina platelets	C04B 35/803 and additional symbols (CCA)for the fibers, whiskers, platelets
Ceramics containing one or more secondary phases	C04B 2235/80 and subgroups

Special rules of classification

If the secondary phase is a ceramic fiber, whisker, platelet or similarly shaped ceramic particle, both C04B 35/803 and C04B 35/117 are given. The same logic applies to C04B 35/117 and C04B 35/74.

The secondary phases are indicated with codes from C04B 2235/32-C04B 2235/428. The code C04B 2235/80 does not need to be used, since the class itself already indicates that secondary phases are present.

C04B 35/119

with zirconium oxide

Definition statement

This place covers:

All sintered alumina ceramics that contain at least one secondary zirconia phase, where this secondary zirconia phase is not a grain boundary phase

References

Limiting references

This place does not cover:

Alumina refractories containing a zirconia secondary phase	C04B 35/106, C04B 35/109

Informative references

Attention is drawn to the following places, which may be of interest for search:

Zirconia-based ceramics containing an alumina secondary phase	C04B 35/4885
Zirconium or hafnium oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. HfO_2	C04B 2235/3244 and subgroups

Special rules of classification

If the amount of alumina phase is larger than the amount of zirconia phase, C04B 35/119 is given, if the amounts are equal, e.g. **C04B40/40**, then both C04B 35/119 and C04B 35/4885 are given.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

ZTA	Zirconia toughened alumina
ATZ	Alumina toughened zirconia

C04B 35/12

based on chromium oxide (C04B 35/047 and C04B 35/105 take precedence)

Definition statement

This place covers:

Ceramics or ceramics mixture of which the largest fraction is formed by a single oxide phase of chromium oxide

References

Limiting references

This place does not cover:

Grain-sized refractory mixtures based on magnesia containing chromium oxide or chrome ore	C04B 35/047 and subgroups
Grain-sized alumina-based refractories containing chromium oxide or chromium ore	C04B 35/105
Mixed oxides of chromium with alkali metals, alkaline earth metals and rare earth metals	C04B 35/42
Mixed oxides of chromium with titanium oxide, containing more Cr, e.g. $Cr_{0.6}Ti_{0.4}O_2$	C04B 35/42
Mixed oxides of chromium with titanium oxide, containing more Ti, e.g. $Cr_{0.4}Ti_{0.6}O_2$	C04B 35/462
Chromium oxide based material with a metallic binder	C22C 29/12

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone chromium oxide	C04B 14/307
Magnesia-based refractories containing chromia	C04B 35/047 and subgroups, C04B 35/051
Alumina-based refractories containing chromia	C04B 35/105
Coating or impregnating ceramic substrates with chromium oxide	C04B 41/5033
Chromium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Cr_2O_3	C04B 2235/3241 and subgroup

Refractory metal oxide interlayer used for joining a ceramic with another substrate	C04B 2237/068
Refractory metal oxide substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/345
The preparation of chromium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 37/00 and subgroups
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: compounds of chromium	C09C 1/34, C09C 1/34 and subgroups

C04B 35/14

based on silica

Definition statement

This place covers:

Ceramics or ceramics mixture of which the largest fraction is formed by a crystalline single oxide phase of SiO_2, e.g. quartz or cristobalite

References

Limiting references

This place does not cover:

Ceramics or ceramics mixture of which the largest fraction is formed by a mixed oxide phase of SiO_2, e.g. silicates such as cordierite, alumino-silicates in general, magnesium silicates such as forsterite, calcium silicates such as wollastonite	C04B 33/00 (clays), C04B 35/16 and subgroups (silicates)
Materials having as largest fraction a form of crystalline SiO_2 but also containing a glass matrix, e.g. 80% quartz and 20% glass matrix	C03C 10/0009

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: granular materials: quartz; sand	C04B 14/06 and subgroups
Making fibers based on silica	C04B 35/6224
Coating or impregnating ceramic substrates with silica	C04B 41/5035
Silica as starting material for making a ceramic or as secondary phase of a sintered ceramic	C04B 2235/3418
Silica or silicate interlayer used for joining a ceramic with another substrate	C04B 2237/062
Silica or silicate substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/341
Materials for prostheses based on silica or silicon oxide	A61F 2310/00215
Silica-based membranes	B01D 71/027
Catalysts comprising silica	B01J 21/08, B01J 21/08, C07C 2521/08

Preparation of silica powders, sols, gels, dispersions and their after-treatments	C01B 33/113 and subgroups
Processes specially adapted for the production of quartz or fused silica articles	C03B 20/00
Pure silica glass, e.g. pure fused quartz	C03B 2201/02 and subgroups, C03C 2201/02
Glass compositions with more than 90% silica by weight, e.g. quartz	C03C 3/06
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: compounds of silicon	C09C 1/28, C09C 1/28 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing silicon	C09K 11/59 and subgroups
Quartz single crystals	C30B 29/18
Silica in machines or engines in general (F01) or machines for liquids (F04)	F05C 2203/0886
Manufacture or treatment of semiconductor devices or of parts thereof, forming insulating materials on a substrate by gas or vapour deposition, the material containing silica	H01L 21/31608 and subgroup

C04B 35/16

based on silicates other than clay {(zircon C04B 35/48)}

Definition statement

This place covers:

All silicates that are not clay (see C04B 33/00 for the definition of clays). A silicate is a compound containing a silicon bearing anion. The great majority of silicates are oxides, but hexafluorosilicate ($[SiF_6]^{2-}$) and other anions are also included. Silicate compounds, including the minerals, consist of silicate anions whose charge is balanced by various cations. Myriad silicate anions can exist, and each can form compounds with many different cations. Hence this class of compounds is very large. Both minerals and synthetic materials fit in this class. Silicates are mainly a mixed oxide phase of SiO_2 with at least one other metal oxide, e.g. transition metal silicates such as iron silicate, or barium silicate, or rare earth silicates.

Relationships with other classification places

Materials having as largest fraction a crystalline silicate phase but also containing a glass matrix, e.g. 80% silicate and 20% glass matrix C03C

References

Limiting references

This place does not cover:

Clay wares	C04B 33/00 and subgroups
Ceramics based on zirconium or hafnium silicates, e.g. zircon ($ZrSiO_4$)	C04B 35/481

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone	C04B 14/04 and subgroups
Coating or impregnating ceramic substrates with silicates	C04B 41/5024
Silica as starting material for making a ceramic or as secondary phase of a sintered ceramic	C04B 2235/3418
Silicates other than clay as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. water glass (Na_2SiO_3)	C04B 2235/3427 and subgroups
Silica or silicate interlayer used for joining a ceramic with another substrate	C04B 2237/062
Silica or silicate substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/341
Preparation of silicate powders, sols, gels, dispersions and their after-treatments	C01B 33/20 and subgroups, C01B 37/005
Coating compositions, e.g. paints, varnishes or lacquers, based on alkali metal silicates	C09D 1/02 and subgroup
Adhesives based on water-soluble alkali silicate	C09J 1/02
Luminescent, e.g. electroluminescent, chemiluminescent materials containing silicates	C09K 11/0838
Luminescent, e.g. electroluminescent, chemiluminescent materials containing iron, nickel and cobalt as silicate	C09K 11/607
Luminescent, e.g. electroluminescent, chemiluminescent materials containing inorganic halogen silicate compounds	C09K 11/617
Luminescent, e.g. electroluminescent, chemiluminescent materials containing germanium, tin or lead silicates	C09K 11/666
Luminescent, e.g. electroluminescent, chemiluminescent materials containing refractory silicates	C09K 11/676
Luminescent, e.g. electroluminescent, chemiluminescent materials containing chromium, molybdenum or tungsten silicates	C09K 11/685
Luminescent, e.g. electroluminescent, chemiluminescent materials containing vanadium silicates	C09K 11/698
Luminescent, e.g. electroluminescent, chemiluminescent materials containing arsenic, antimony or bismuth silicates	C09K 11/7442, C09K 11/757
Luminescent, e.g. electroluminescent, chemiluminescent materials containing rare earth silicates	C09K 11/7706, C09K 11/7721, C09K 11/7734, C09K 11/7749, C09K 11/7758, C09K 11/7764, C09K 11/7774, C09K 11/7792
Single crystals of silicates	C30B 29/34

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Silicate mineral	Mineralogically, silicate minerals are divided according to structure of their silicate anion into the following groups: Nesosilicates (lone tetrahedron) - $[SiO_4]^{4-}$, e.g. olivine. Sorosilicates (double tetrahedra) - $[Si_2O_7]^{6-}$, e.g. epidote, melilite group. Cyclosilicates (rings) - $[Si_nO_{3n}]^{2n-}$, e.g. tourmaline group. Inosilicates (single chain) - $[SinO_{3n}]^{2n-}$, e.g. pyroxene group. Inosilicates(double chain) - $[Si_{4n}O_{11n}]^{6n-}$, e.g. amphibole group. Phyllosilicates (sheets) - $[Si_{2n}O_{5n}]^{2n-}$, e.g. micas and clays. Tectosilicates (3D framework) - $[Al_xSi_yO_{2(x+y)}]^{x-}$, e.g. quartz, feldspars, zeolites. Note that tectosilicates can only have additional cations if some of the silicon is replaced by a lower-charge cation such as aluminium . Al for Si substitution is common.

C04B 35/18

rich in aluminium oxide

Definition statement

This place covers:

Ceramics or ceramics mixture of which the largest fraction is formed by a mixed oxide phase of SiO_2 with alumina, the alumino-silicates

References

Limiting references

This place does not cover:

Materials made of clay	C04B 33/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Making fibres based on silica, rich in aluminium oxide	C04B 35/62245
Aluminium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. bauxite, alpha-alumina	C04B 2235/3217 and subgroups
Alumino-silicates other than clay as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. mullite ($3Al_2O_3$-$2SiO_2$)	C04B 2235/3463 and subgroups
Catalysts comprising silica and alumina	B01J 21/12, B01J 21/12, C07C 2521/12
Catalysts comprising Crystalline aluminosilicate zeolites; Isomorphous compounds thereof	B01J 29/06 and subgroups
Preparation of aluminium containing silicate powders, sols, gels, dispersions and their after-treatments	C01B 33/26 and subgroups

Luminescent, e.g. electroluminescent, chemiluminescent materials containing aluminium silicates	C09K 11/646

C04B 35/185

Mullite {3Al2O3-2SiO2}

Definition statement

This place covers:

Ceramics or ceramics mixture of which the largest fraction is formed by a mullite phase

Relationships with other classification places

Materials having as largest fraction a mullite phase but also containing a glass matrix, e.g. 80% mullite and 20% glass matrix C03C

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Mullite catalysts or catalysts supports	B01J 21/16

C04B 35/19

Alkali metal aluminosilicates, e.g. spodumene

Definition statement

This place covers:

Ceramics or ceramics mixture of which the largest fraction is formed by an alumino-silicate phase containing more alkali metal ions than ions of other type, such as alkaline earth metal ions

References

Limiting references

This place does not cover:

Materials having as largest fraction a spodumene phase but also containing a glass matrix, e.g. 80% spodumene and 20% glass matrix	C03C 10/0018 and subgroup

Informative references

Attention is drawn to the following places, which may be of interest for search:

Alkali oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Na_2O, K_2O	C04B 2235/3201 and subgroup
Alkali metal alumino-silicates other than clay as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. spodumene ($LiAlSi_2O_6$), alkali feldspars such as Albite ($NaAlSi_3O_8$) or Orthoclase ($KAlSi_3O_8$), micas such as Muscovite ($KAl_2(AlSi_3)O_{10}(OH)_2$), zeolites such as Natrolite ($Na_2Al_2Si_3O_{10}\cdot 2H_2O$)	C04B 2235/3472

C04B 35/195

Alkaline earth aluminosilicates, e.g. cordierite {or anorthite}

Definition statement

This place covers:

Ceramics or ceramics mixture of which the largest fraction is formed by an alumino-silicate phase containing more alkaline earth metal ions than ions of other type, such as alkali metal ions

References

Limiting references

This place does not cover:

Materials having as largest fraction a cordierite phase but also containing a glass matrix, e.g. 80% cordierite and 20% glass matrix	C03C 10/0045

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cordierite honeycombs	C04B 38/0006 and subgroups
Alkaline earth oxides or salts as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3205 and subgroups
Alkaline earth metal alumino-silicates other than clay as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. cordierite ($(Mg,Fe)_2Al_3(Si_5AlO_{18})$), beryl ($Be_3Al_2(Si_6O_{18})$), micas such as margarite ($CaAl_2(Al_2Si_2)O_{10}(OH)_2$), plagioclase feldspars such as anorthite ($CaAl_2Si_2O_8$), zeolites such as chabazite ($CaAl_2Si_4O_{12}\cdot 6H_2O$)	C04B 2235/3481
Cordierite honeycombs containing a catalyst	B01J 35/04

Special rules of classification

The cordierite honeycombs are normally classified in C04B 38/0006, but receive classification in C04B 35/195 as well, if specific details regarding the starting materials are given, or if the end-composition of the cordierite is specified, e.g. the presence of a certain secondary phase or the use of certain combinations of starting materials.

C04B 35/20

rich in magnesium oxide, {e.g. forsterite (C04B 35/195 takes precedence)}

Definition statement

This place covers:

All silicate ceramics or ceramic mixtures containing a substantial amount of MgO, thus not containing MgO as an impurity

Relationships with other classification places

Materials having as largest fraction a forsterite phase but also containing a glass matrix, e.g. 80% forsterite and 20% glass matrix C03C

References

Limiting references

This place does not cover:

Magnesium alumino-silicates	C04B 35/195

Informative references

Attention is drawn to the following places, which may be of interest for search:

Magnesium silicates as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. forsterite (Mg_2SiO_4)	C04B 2235/3445
Catalysts comprising silica and magnesia	B01J 21/14, B01J 21/14, C07C 2521/14
Preparation of magnesium silicate powders, sols, gels, dispersions and their after-treatments	C01B 33/22

C04B 35/22

rich in calcium oxide, {e.g. wollastonite (C04B 35/195 takes precedence)}

Definition statement

This place covers:

All silicate ceramics or ceramic mixtures containing a substantial amount of CaO, thus not containing CaO as an impurity

Relationships with other classification places

Materials having as largest fraction a forsterite phase but also containing a glass matrix, e.g. 80% forsterite and 20% glass matrix C03C

References

Limiting references

This place does not cover:

Calcium alumino-silicates	C04B 35/195

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: alkaline-earth metal silicates, e.g. wollastonite	C04B 14/043
Calcium silicate based hydraulic cement	C04B 28/02 and subgroups
Calcium silicates as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. wollastonite ($CaSiO_3$)	C04B 2235/3454
Preparation of alkaline earth metal silicate powders, sols, gels, dispersions and their after-treatments	C01B 33/24

Calcium silicates as compounding ingredient for polymers	C08K 3/34

C04B 35/26

based on ferrites

Definition statement

This place covers:

All oxidic ferrites, combinations between Fe_2O_3 and other oxides, such as FeO, ZnO, MnO, BaO, as well as Fe_2O_3 (hematite) itself

References

Limiting references

This place does not cover:

Metallic ferrite (Fe)	C22C 38/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: ferrites	C04B 14/363
Coating or impregnating ceramic substrates with ferrite	C04B 41/5036
Ferrites as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. manganese ferrite ($MnFe_2O_4$)	C04B 2235/3274
The preparation of iron compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds being mixed oxides or hydroxides, e.g. ferrites	C01G 49/0018 and subgroups
The preparation of iron compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds containing, besides iron, two or more other elements, with the exception of oxygen or hydrogen	C01G 49/009
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: compounds of iron	C09C 1/22, C09C 1/22 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing iron, nickel and cobalt	C09K 11/60 and subgroups
Recording by magnetisation or demagnetisation of a record carrier; Reproducing by magnetic means; Record carriers therefore: the pole pieces being ferrite	G11B 5/193, G11B 5/193
Recording by magnetisation or demagnetisation of a record carrier; Reproducing by magnetic means; Record carriers therefore: record carriers characterised by the selection of the material comprising one or more layers of magnetisable material homogeneously mixed with a bonding agent the magnetic material being a ferrite	G11B 5/70678, G11B 5/70678 and subgroups

Non-adjustable resistors formed as one or more layers or coatings; Non-adjustable resistors made from powdered conducting material or powdered semi-conducting material with or without insulating material having negative temperature coefficient mainly consisting of iron oxides or ferrites	H01C 7/046
Ferrite magnets	H01F 1/0315, H01F 1/0315
Hard magnetic material, e.g. ferrites	H01F 1/10, H01F 1/10
Soft magnetic material, e.g. ferrites	H01F 1/344, H01F 1/344 and subgroups
Thin magnetic films, e.g. of one-domain structure made of ferrites	H01F 10/20, H01F 10/20 and subgroups
Details of cathode ray tubes or electron beam tubes Electron beam control outside the vessel by magnetic fields Cores for field producing elements, e.g. ferrite	H01J 2229/7031
Loop aerials with a substantially uniform current distribution around the loop and having a directional radiation pattern in a plane perpendicular to the plane of the loop with ferrite rod or like elongated core	H01Q 7/08
Heater elements characterised by the composition or nature of the materials or by the arrangement of the conductor: conductive ceramics, e.g. metal oxides, metal carbides, barium titanate, ferrites, zirconia, vitreous compounds	H05B 3/141 and subgroup
The effect of many metal oxide additives on the grain growth of ferrites is mentioned	document XP022314655, table 1

Special rules of classification

The sintered ferrite bodies are classified in C04B 35/00 as well as in H01F. Ferrite powders are classified in C01G 49/00, as well as H01F. The synthesis of ferrite powders is also classified in C04B 35/00 if the ferrite composition is a new composition or if the synthesis is preparatory to making a sintered body. More than one subgroup of C04B 35/26 can be attributed due to one ferrite composition.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Ferrite	Chemical compounds consisting of ceramic materials with iron (III) oxide (Fe_2O_3) as their principal component. Many of them are magnetic materials and they are used to make permanent magnets, ferrite cores for transformers, and in various other applications. Many ferrites are spinels with the formula AB_2O_4, where A and B represent various metal cations, usually including iron. Some ferrites have hexagonal crystal structure, e.g. barium ferrite $BaO{:}6Fe_2O_3$ or $BaFe_{12}O_{19}$.

C04B 35/2608

{Compositions containing one or more ferrites of the group comprising manganese, zinc, nickel, copper or cobalt and one or more ferrites of the group comprising rare earth metals, alkali metals, alkaline earth metals or lead}

Definition statement

This place covers:

The metal ions can be part both of the main composition as additives to the main composition.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Compositions containing one or more ferrites of the group comprising rare earth metals and one or more of the group comprising alkali metals, alkaline earth metals or lead	C04B 35/2641
Compositions containing one or more ferrites of the group comprising manganese, zinc and one or more ferrites of the group comprising nickel, copper or cobalt	C04B 35/265
Other ferrites containing manganese or zinc, e.g. Mn-Zn ferrites	C04B 35/2658
Other ferrites containing nickel, copper or cobalt	C04B 35/2666
Other ferrites containing rare earth metals, e.g. rare earth ferrite garnets	C04B 35/2675
Other ferrites containing alkaline earth metals or lead	C04B 35/2683
Alkali oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Na_2O, K_2O	C04B 2235/3201 and subgroup
Alkaline earth oxides or salts as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3205 and subgroups
Rare earth oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Sc_2O_3, Lu_2O_3, Nd_2O_3	C04B 2235/3224
Manganese or rhenium oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. MnO	C04B 2235/3262 and subgroups
Cobalt oxides, cobaltites or cobaltates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. zinc cobaltite ($ZnCo_2O_4$) or bismuth cobaltate ($BiCoO_3$)	C04B 2235/3275 and subgroup
Nickel oxides, nickelates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. NiO	C04B 2235/3279
Copper oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. CuO or Cu_2O	C04B 2235/3281 and subgroup
Zinc oxides, zincates, cadmium oxides, cadmiates, mercury oxides, mercurates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. ZnO	C04B 2235/3284

Lead oxides, plumbates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. silver plumbate ($Ag_5Pb_2O_6$)	C04B 2235/3296
The preparation of iron compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds being mixed oxides or hydroxides, e.g. ferrites, containing one alkali metal	C01G 49/0027
The preparation of iron compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds being mixed oxides or hydroxides, e.g. ferrites, containing alkaline earth metal, magnesium or lead	C01G 49/0036
The preparation of iron compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds being mixed oxides or hydroxides, e.g. ferrites, containing one rare earth metal, yttrium or scandium	C01G 49/0054
The preparation of iron compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds being mixed oxides or hydroxides, e.g. ferrites, containing zinc	C01G 49/0063
The preparation of iron compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds being mixed oxides or hydroxides, e.g. ferrites, containing manganese	C01G 49/0072

Special rules of classification

If the ferrite contains Mn/Zn/Ni/Cu/Co and rare earth and alkali/alkaline earth/lead both C04B 35/2608 and C04B 35/2641 are attributed. If it also contains both Mn/Zn and Ni/Cu/Co C04B 35/265 is attributed as well. Thus, C04B 35/2608, C04B 35/2641 and C04B 35/265 could be attributed to one and the same ferrite composition. If C04B 35/2608 is attributed for a certain ferrite, C04B 35/2658, C04B 35/2666, C04B 35/2675, C04B 35/2683 and C04B 35/2691 are not attributed for this ferrite composition. These classes could of course be attributed due to other ferrite compositions in the same document.

Since none of the individual metal ions of Mn/Zn/Ni/Cu/Co and rare earth and alkali/alkaline earth/lead necessarily needs to be present, when C04B 35/2608 is given, all metal ions present (except for Fe) need to be classified with symbols from C04B 2235/00.

C04B 35/2616

{containing lithium}

Definition statement

This place covers:

The ferrite containing Mn, Zn, Ni, Cu or Co and also Li

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Lithium oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Li_2O	C04B 2235/3203
The preparation of iron compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds being mixed oxides or hydroxides, e.g. ferrites, containing one alkali metal	C01G 49/0027

Special rules of classification

Since here the Li-ion necessarily needs to be present, the additional symbol (CCA) for Li (C04B 2235/3203) is not necessary

C04B 35/2625

{containing magnesium}

Definition statement

This place covers:

The ferrite containing Mn, Zn, Ni, Cu or Co and also Mg

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Magnesium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3206
The preparation of iron compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds being mixed oxides or hydroxides, e.g. ferrites, containing alkaline earth metal, magnesium or lead	C01G 49/0036

C04B 35/2633

{containing barium, strontium or calcium}

Definition statement

This place covers:

Ferrites like barium hexaferrite, doped with Mn/Zn/Ni/Cu/Co.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Calcium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. lime	C04B 2235/3208 and subgroups
Strontium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3213
Barium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3215
The preparation of iron compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds being mixed oxides or hydroxides, e.g. ferrites, containing alkaline earth metal, magnesium or lead	C01G 49/0036
Soft magnetic material, e.g. Hexaferrites with decreased hardness or anisotropy, i.e. with increased permeability in the microwave (GHz) range	H01F 1/348
Thin magnetic films, e.g. of one-domain structure made of hexagonal ferrites	H01F 10/205

C04B 35/2641

{Compositions containing one or more ferrites of the group comprising rare earth metals and one or more ferrites of the group comprising alkali metals, alkaline earth metals or lead}

Definition statement

This place covers:

The ferrite containing a rare earth like La, Nd, Ce and for instance Li, Na, K, Ba, Sr, Mg, Ca, W

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Compositions containing one or more ferrites of the group comprising manganese, zinc, nickel, copper or cobalt and one or more ferrites of the group comprising rare earth metals, alkali metals, alkaline earth metals or lead	C04B 35/2608 and subgroups
Other ferrites containing rare earth metals, e.g. rare earth ferrite garnets	C04B 35/2675
Other ferrites containing alkaline earth metals or lead	C04B 35/2683
Alkali oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Na_2O, K_2O	C04B 2235/3201 and subgroup
Alkaline earth oxides or salts as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3205 and subgroups
Rare earth oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Sc_2O_3, Lu_2O_3, Nd_2O_3	C04B 2235/3224
Lead oxides, plumbates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. silver plumbate ($Ag_5Pb_2O_6$)	C04B 2235/3296
The preparation of iron compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds being mixed oxides or hydroxides, e.g. ferrites, containing one alkali metal	C01G 49/0027
The preparation of iron compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds being mixed oxides or hydroxides, e.g. ferrites, containing alkaline earth metal, magnesium or lead	C01G 49/0036
The preparation of iron compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds being mixed oxides or hydroxides, e.g. ferrites, containing one rare earth metal, yttrium or scandium	C01G 49/0054

Special rules of classification

If the ferrite contains Mn/Zn/Ni/Cu/Co and rare earth and alkali/alkaline earth/lead both C04B 35/2608 and C04B 35/2641 are attributed. If it also contains both Mn/Zn and Ni/Cu/Co C04B 35/265 is attributed as well. Thus, C04B 35/2608, C04B 35/2641 and C04B 35/265 could be attributed to one and the same ferrite composition. If C04B 35/2641 is attributed for a certain ferrite, C04B 35/2658, C04B 35/2666, C04B 35/2675, C04B 35/2683 and C04B 35/2691 are not attributed for this ferrite

composition. These classes could of course be attributed due to other ferrite compositions in the same document.

C04B 35/265

{Compositions containing one or more ferrites of the group comprising manganese or zinc and one or more ferrites of the group comprising nickel, copper or cobalt}

Definition statement

This place covers:

The ferrite containing Mn or Zn and one of the group Ni, Cu, Co

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Compositions containing one or more ferrites of the group comprising manganese, zinc, nickel, copper or cobalt and one or more ferrites of the group comprising rare earth metals, alkali metals, alkaline earth metals or lead	C04B 35/2608 and subgroups
Other ferrites containing manganese or zinc, e.g. Mn-Zn ferrites	C04B 35/2658
Other ferrites containing nickel, copper or cobalt	C04B 35/2666
Manganese or rhenium oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. MnO	C04B 2235/3262 and subgroups
Cobalt oxides, cobaltites or cobaltates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. zinc cobaltite ($ZnCo_2O_4$) or bismuth cobaltate ($BiCoO_3$)	C04B 2235/3275 and subgroup
Nickel oxides, nickelates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. NiO	C04B 2235/3279
Copper oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. CuO or Cu_2O	C04B 2235/3281 and subgroup
Zinc oxides, zincates, cadmium oxides, cadmiates, mercury oxides, mercurates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. ZnO	C04B 2235/3284
The preparation of iron compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds being mixed oxides or hydroxides, e.g. ferrites, containing zinc	C01G 49/0063
The preparation of iron compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds being mixed oxides or hydroxides, e.g. ferrites, containing manganese	C01G 49/0072

Special rules of classification

If the ferrite contains Mn/Zn/Ni/Cu/Co and rare earth and alkali/alkaline earth/lead both C04B 35/2608 and C04B 35/2641 are attributed. If it also contains both Mn/Zn and Ni/Cu/Co C04B 35/265 is attributed as well. Thus, C04B 35/2608, C04B 35/2641 and C04B 35/265 could be attributed to one and the same ferrite composition. If C04B 35/265 is attributed for a certain ferrite, C04B 35/2658,

C04B 35/2666, C04B 35/2675, C04B 35/2683 and C04B 35/2691 are not attributed for this ferrite composition. These classes could of course be attributed due to other ferrite compositions in the same document.

C04B 35/2658

{Other ferrites containing manganese or zinc, e.g. Mn-Zn ferrites}

Definition statement

This place covers:

The ferrite contains usually both Mn and Zn, the common Mn-Zn ferrite

References

Limiting references

This place does not cover:

Compositions containing one or more ferrites of the group comprising manganese, zinc, nickel, copper or cobalt and one or more ferrites of the group comprising rare earth metals, alkali metals, alkaline earth metals or lead	C04B 35/2608 and subgroups
Compositions containing one or more ferrites of the group comprising manganese, zinc and one or more ferrites of the group comprising nickel, copper or cobalt	C04B 35/265

Informative references

Attention is drawn to the following places, which may be of interest for search:

Manganese or rhenium oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. MnO	C04B 2235/3262 and subgroups
Zinc oxides, zincates, cadmium oxides, cadmiates, mercury oxides, mercurates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. ZnO	C04B 2235/3284
The preparation of iron compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds being mixed oxides or hydroxides, e.g. ferrites, containing zinc	C01G 49/0063
The preparation of iron compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds being mixed oxides or hydroxides, e.g. ferrites, containing manganese	C01G 49/0072

C04B 35/2666

{Other ferrites containing nickel, copper or cobalt}

Definition statement

This place covers:

Ferrites containing Ni, Co, Cu, but not Zn or Mn

References

Limiting references

This place does not cover:

Compositions containing one or more ferrites of the group comprising manganese, zinc, nickel, copper or cobalt and one or more ferrites of the group comprising rare earth metals, alkali metals, alkaline earth metals or lead	C04B 35/2608 and subgroups
Compositions containing one or more ferrites of the group comprising manganese, zinc and one or more ferrites of the group comprising nickel, copper or cobalt	C04B 35/265

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cobalt oxides, cobaltites or cobaltates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. zinc cobaltite ($ZnCo_2O_4$) or bismuth cobaltate ($BiCoO_3$)	C04B 2235/3275 and subgroup
Nickel oxides, nickelates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. NiO	C04B 2235/3279
Copper oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. CuO or Cu_2O	C04B 2235/3281 and subgroup

C04B 35/2675

{Other ferrites containing rare earth metals, e.g. rare earth ferrite garnets}

Definition statement

This place covers:

Ferrites containing rare earth metal oxides such as La, Nd, Sm, but not alkaline earth metal oxides, Cu, Co, Zn, Ni, Mn

References

Limiting references

This place does not cover:

Compositions containing one or more ferrites of the group comprising manganese, zinc, nickel, copper or cobalt and one or more ferrites of the group comprising rare earth metals, alkali metals, alkaline earth metals or lead	C04B 35/2608 and subgroups
Compositions containing one or more ferrites of the group comprising rare earth metals and one or more of the group comprising alkali metals, alkaline earth metals or lead	C04B 35/2641

Informative references

Attention is drawn to the following places, which may be of interest for search:

Rare earth oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Sc_2O_3, Lu_2O_3, Nd_2O_3	C04B 2235/3224
Garnet type symmetry	C04B 2235/764
The preparation of iron compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds being mixed oxides or hydroxides, e.g. ferrites, containing one rare earth metal, yttrium or scandium	C01G 49/0054

C04B 35/2683

{Other ferrites containing alkaline earth metals or lead}

Definition statement

This place covers:

Ferrites like barium hexaferrite.

References

Limiting references

This place does not cover:

Compositions containing one or more ferrites of the group comprising manganese, zinc, nickel, copper or cobalt and one or more ferrites of the group comprising rare earth metals, alkali metals, alkaline earth metals or lead	C04B 35/2608 and subgroups
Compositions containing one or more ferrites of the group comprising rare earth metals and one or more of the group comprising alkali metals, alkaline earth metals or lead	C04B 35/2641

Informative references

Attention is drawn to the following places, which may be of interest for search:

Alkaline earth oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. BeO	C04B 2235/3205 and subgroups
Lead oxides, plumbates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. silver plumbate ($Ag_5Pb_2O_6$)	C04B 2235/3296
The preparation of iron compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds being mixed oxides or hydroxides, e.g. ferrites, containing alkaline earth metal, magnesium or lead	C01G 49/0036

C04B 35/2691

{Other ferrites containing alkaline metals}

Definition statement

This place covers:

Ferrites containing alkali metal oxides but not rare earth metal oxides or oxides of Cu, Ni, Co, Mn, Zn

References

Limiting references

This place does not cover:

Compositions containing one or more ferrites of the group comprising manganese, zinc, nickel, copper or cobalt and one or more ferrites of the group comprising rare earth metals, alkali metals, alkaline earth metals or lead	C04B 35/2608 and subgroups
Compositions containing one or more ferrites of the group comprising rare earth metals and one or more of the group comprising alkali metals, alkaline earth metals or lead	C04B 35/2641

Informative references

Attention is drawn to the following places, which may be of interest for search:

Alkali oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Na_2O, K_2O	C04B 2235/3201 and subgroup
The preparation of iron compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds being mixed oxides or hydroxides, e.g. ferrites, containing one alkali metal	C01G 49/0027

C04B 35/42

based on chromites (C04B 35/047 and C04B 35/105 take precedence)

Definition statement

This place covers:

Chromites and chromates. All ceramics containing as the largest phase mixed oxides of chromium with alkali metals, alkaline earth metals and rare earth metals, not containing other transition or post-transition metal oxides, or mixed oxides of chromium with other transition or post-transition metal oxides, in which the amount of chromium is larger than of any other transition or post-transition metal oxide, e.g. a mixture with titanium oxide, containing more Cr, e.g. $Cr_{0.6}Ti_{0.4}O_2$.

References

Limiting references

This place does not cover:

Grain-sized refractory mixtures based on magnesia containing chromium oxide or chrome ore	C04B 35/047 and subgroups
Grain-sized alumina-based refractories containing chromium oxide or chromium ore	C04B 35/105

Mixed oxides of chromium with other transition or post-transition metal oxides, in which there is at least one other transition or post-transition metal oxide in an amount larger than chromium, e.g. a mixture with titanium oxide, containing more Ti, e.g. $Cr_{0.4}Ti_{0.6}O_2$.	C04B 35/462

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as active ingredients for mortars, concrete or artificial stone, e.g. accelerators	C04B 22/087
Chromium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Cr_2O_3	C04B 2235/3241 and subgroup
Chromates or chromites as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. aluminum chromate $Al_2(CrO_4)_3$ or lanthanum strontium chromite ($La_{1-x}Sr_xCrO_3$)	C04B 2235/3243
Refractory metal oxide interlayer used for joining a ceramic with another substrate	C04B 2237/068
Refractory metal oxide substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/345
Chromite containing catalysts	B01J 23/26, B01J 23/86 and subgroups
The preparation of chromium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, compounds containing, besides chromium, two or more other elements, with the exception of oxygen or hydrogen	C01G 37/006
The preparation of chromium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds being chromates or bichromates	C01G 37/14
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: zinc chromate	C09C 1/08, C09C 1/08
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: lead chromate	C09C 1/20, C09C 1/20
Luminescent, e.g. electroluminescent, chemiluminescent materials containing chromium, molybdenum or tungsten	C09K 11/68 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing arsenic, antimony or bismuth vanadates; Chromates; Molybdates; Tungstates	C09K 11/7457, C09K 11/758
Luminescent, e.g. electroluminescent, chemiluminescent materials containing rare earth vanadates; Chromates; Molybdates; Tungstates	C09K 11/7708, C09K 11/7722, C09K 11/7736, C09K 11/7751, C09K 11/7765, C09K 11/7776, C09K 11/7794
Fuel cells containing Chromium complex oxides	H01M 8/0219

C04B 35/44

based on aluminates

Definition statement

This place covers:

All mixed oxides in which alumina is mixed with alkali metal oxides, alkaline earth metal oxides or rare earth metal oxides.

References

Limiting references

This place does not cover:

Ceramics based on aluminate-silicate	C04B 33/00 and subgroups (clays) or C04B 35/18 and subgroups
Ceramics based on beta-aluminas ($MAl_{11}O_{18}$ or $LnAl_{12}O_{19}$)	C04B 35/113

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as active ingredients for mortars, concrete or artificial stone, e.g. accelerators: aluminates	C04B 22/0093
Hydraulic aluminate cements	C04B 28/06 and subgroup, C04B 7/323
Ceramics based on alumina single oxide phase	C04B 35/10 and subgroups
Coating or impregnating ceramic substrates with aluminate	C04B 41/5032
Aluminium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. bauxite, alpha-alumina	C04B 2235/3217 and subgroups
Aluminates other than alumino-silicates as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. spinel ($MgAl_2O_4$)	C04B 2235/3222
Alumina or aluminate interlayer used for joining a ceramic with another substrate	C04B 2237/064
Alumina or aluminate substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/343
Aluminate catalysts or catalysts carrier	B01J 21/04, B01J 23/78
Preparation of alkali metal aluminates powders	C01F 7/04 and subgroups
Preparation of alkaline earth metal aluminates powders	C01F 7/16 and subgroups
Purification of aluminates	C01F 7/47 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing aluminates	C09K 11/0838
Luminescent, e.g. electroluminescent, chemiluminescent materials containing germanium, tin or lead aluminates	C09K 11/666

Luminescent, e.g. electroluminescent, chemiluminescent materials containing refractory metal aluminates	C09K 11/676
Luminescent, e.g. electroluminescent, chemiluminescent materials containing chromium, molybdenum or tungsten aluminates	C09K 11/685
Luminescent, e.g. electroluminescent, chemiluminescent materials containing vanadium aluminates	C09K 11/698
Luminescent, e.g. electroluminescent, chemiluminescent materials containing arsenic, antimony or bismuth aluminates	C09K 11/7442, C09K 11/757
Luminescent, e.g. electroluminescent, chemiluminescent materials containing rare earth aluminates	C09K 11/7706, C09K 11/7721, C09K 11/7734, C09K 11/7749, C09K 11/7758, C09K 11/7764, C09K 11/7774, C09K 11/7792
Devices characterised by the luminescent material	H01J 61/44
Thin film transistors having a semiconductor body comprising an oxide semiconductor material, e.g. zinc oxide, copper aluminium oxide, cadmium stannate	H01L 29/7869

C04B 35/443

Magnesium aluminate spinel

Definition statement

This place covers:

Ceramics based on magnesium aluminate ($MgOAl_2O_3$ or $MgAl_2O_4$) having the spinel phase

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on magnesia single oxide phase	C04B 35/04 and subgroups
Ceramics based on alumina single oxide phase	C04B 35/10 and subgroups
Coating or impregnating ceramic substrates with spinels	C04B 41/5046
Magnesium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3206
Ceramics in general with the spinel symmetry	C04B 2235/763
Catalysts comprising spinels	B01J 21/005, B01J 21/005, C07C 2521/00

Special rules of classification

If the class C04B 35/443 is given, C04B 2235/763 does not need to be given.

C04B 35/447

based on phosphates, {e.g. hydroxyapatite}

Definition statement

This place covers:

Ceramics based on inorganic phosphor-oxide compounds

References

Limiting references

This place does not cover:

Ceramics based on metal-phosphor compounds without oxygen, the phosphides	C04B 35/5154
Ceramics having a phosphate binder	C04B 35/6306 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Phosphate cements	C04B 12/02 and subgroups
Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: phosphates, e.g. apatite	C04B 14/366
Making fibres based on phosphates	C04B 35/62268
Coating or impregnating ceramic substrates with phosphates	C04B 41/5048, C04B 41/5092 (phosphate cements), C04B 41/67
Calcium phosphates, e.g. hydroxyapatite additives or secondary phases	C04B 2235/3212
Phosphates or phosphites (calcium phosphates C04B 2235/3212) as starting material for making ceramics, e.g. orthophosphate (PO_4^{3-}), pyrophosphate ($P_2O_7^{4-}$), hypophosphite ($H_2PO_2^-$), or present as secondary phase in the sintered ceramic	C04B 2235/447
Materials for prostheses containing a phosphorus-containing compound, e.g. apatite	A61L 27/12, A61L 27/12
Phosphate catalysts	B01J 27/18 and subgroups, B01J 29/82 and subgroups
Preparation of phosphates per se, e.g. phosphates powder, not preparative to making a phosphates ceramic	C01B 25/26 and subgroups, C01B 37/002
Luminescent, e.g. electroluminescent, chemiluminescent materials containing phosphates	C09K 11/0855 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing phosphorus	C09K 11/70 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing arsenic, antimony or bismuth phosphates	C09K 11/7464 and subgroups

Luminescent, e.g. electroluminescent, chemiluminescent materials containing rare earth phosphates	C09K 11/7709 and subgroups, C09K 11/7723 and subgroups, C09K 11/7737 and subgroups, C09K 11/7752 and subgroups, C09K 11/7777 and subgroups, C09K 11/7795 and subgroups
Phosphate single crystals	C30B 29/14

C04B 35/45

based on copper oxide or solid solutions thereof with other oxides

Definition statement

This place covers:

Precursor materials for ceramic superconductors and high critical-temperature superconductive materials characterised by the ceramic-forming technique or the ceramic composition based on cuprates.

Non superconductive ceramic copper oxides or solid solutions thereof with other oxides.

Relationships with other classification places

Single-crystals or homogeneous polycrystalline material with defined structure or crystallographic orientation characterised by the material or by the method: C30B

References

Limiting references

This place does not cover:

Mixed oxide of copper oxide and iron oxide: ferrite	C04B 35/2608 and subgroups, C04B 35/265, C04B 35/2666

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: copper oxide or solid solutions thereof	C04B 14/309
Making fibres based on copper oxide	C04B 35/62254
Coating or impregnating ceramic substrates with copper oxide ceramic material	C04B 41/5074 and subgroup
Copper oxides, cuprates or oxide-forming salts thereof, e.g. CuO or Cu_2O as additive for ceramics or as secondary phase	C04B 2235/3281
The preparation of copper compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds containing, besides copper, two or more other elements, with the exception of oxygen or hydrogen	C01G 3/006

Luminescent, e.g. electroluminescent, chemiluminescent materials containing copper, silver or gold	C09K 11/58 and subgroups
Ceramic superconductor Rope or cable materials	D07B 2205/405
Superconductive conductors, cables, or transmission lines	H01B 12/00 and subgroups
Superconducting magnets or coils	H01F 6/00 and subgroups
Superconductors characterised by the material, containing copper oxide	H01L 39/126, H01L 39/126 and subgroup
Processes peculiar to the manufacture or treatment of composite superconductor filaments comprising copper oxide	H01L 39/2419, H01L 39/2419 and subgroups

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

HTS or High-Tc	These abbreviations correspond to the term "high critical-temperature superconductor".
Y-Ba-Cu-O	In patent literature this abbreviation is used for the general substance group, which includes e.g. the compounds $Y_1Ba_2Cu_3Ox$ or $Y_2Ba_1Cu_1O_5$ corresponding to the short cuts Y-123 or Y-211.
Bi-Sr-Ca-Cu-O	In patent literature this abbreviation is used for the general substance group, which includes e.g. the compounds $Bi_2Sr_2Ca_2Cu_3Ox$ or $Bi_2Sr_2Ca_1Cu_2O_x$ corresponding to the short cuts Bi-2223 or Bi-2212.
Hg-Ba-Ca-Cu-O	In patent literature this abbreviation is used for the general substance group, which includes e.g. the compound $Hg_1Ba_2Ca_2Cu_3O_x$ corresponding to the short cut Hg-1223.
Tl-Sr-Ca-Cu-O	In patent literature this abbreviation is used for the general substance group, which includes e.g. the compound $Tl_2Sr_2Ca_2Cu_3O_x$ corresponding to the short cut Tl-2223.

C04B 35/4504

{containing rare earth oxides}

Definition statement

This place covers:

Ceramics based on yttrium, lanthanum or cerium oxide containing cuprates.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Rare earth oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Sc_2O_3, Lu_2O_3, Nd_2O_3	C04B 2235/3224

Cuprates or oxide-forming salts thereof, as additive for ceramics or as secondary phase	C04B 2235/3282
Complex oxides based on rare earth copper oxide single crystals	C30B 29/225

C04B 35/4508

{Type 1-2-3}

Definition statement

This place covers:

The compounds $Y_1Ba_2Cu_3Ox$ or $Y_2Ba_1Cu_1O_5$ corresponding to the short cuts Y-123 or Y-211

C04B 35/4512

{containing thallium oxide}

Definition statement

This place covers:

For instance ceramics based on the compound $Tl_2Sr_2Ca_2Cu_3O_x$ corresponding to the short cut Tl-2223

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cuprates or oxide-forming salts thereof, as additive for ceramics or as secondary phase	C04B 2235/3282
Gallium oxides, gallates, indium oxides, indates, thallium oxides, thallates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. zinc gallate ($ZnGa_2O_4$)	C04B 2235/3286

C04B 35/4517

{also containing lead oxide}

Definition statement

This place covers:

The cuprate containing both thallium oxide and lead oxide

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Lead oxides, plumbates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. silver plumbate ($Ag_5Pb_2O_6$)	C04B 2235/3296

C04B 35/4521

{containing bismuth oxide}

Definition statement

This place covers:

Ceramics based for instance on the compounds $Bi_2Sr_2Ca_2Cu_3O_x$ or $Bi_2Sr_2Ca_1Cu_2O_x$ corresponding to the short cuts Bi-2223 or Bi-2212.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cuprates or oxide-forming salts thereof, as additive for ceramics or as secondary phase	C04B 2235/3282
Bismuth oxides, bismuthates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. zinc bismuthate ($Zn(BiO_3)_2$)	C04B 2235/3298

C04B 35/4525

{also containing lead oxide}

Definition statement

This place covers:

The cuprate containing both bismuth oxide and lead oxide

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Lead oxides, plumbates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. silver plumbate ($Ag_5Pb_2O_6$)	C04B 2235/3296

C04B 35/453

based on zinc, tin, or bismuth oxides or solid solutions thereof with other oxides, e.g. zincates, stannates or bismuthates

Definition statement

This place covers:

Ceramics based on the single metal oxide ZnO or Bi_2O_3. Mixed oxides of ZnO with gallium or indium oxide. Mixed oxides of ZnO with gallium or indium oxide and also tin oxide, containing more zinc oxide then tin oxide. Mixed oxides of alkali metal, alkaline metal oxide or rare earth metal oxide with bismuth oxide, the bismuthates.

References

Limiting references

This place does not cover:

Mixed oxide of zinc oxide and iron oxide: ferrite	C04B 35/2608 and subgroups, C04B 35/265, C04B 35/2658
Ceramics based on mixed oxides of bismuth with copper: cuprates	C04B 35/4521 and subgroup
Ceramics based on mixed oxides of bismuth with titanium: bismuth titanate	C04B 35/478

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating ceramic substrates with zinc or bismuth oxides	C04B 41/5049
Zinc oxides, zincates, cadmium oxides, cadmiates, mercury oxides, mercurates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. ZnO	C04B 2235/3284
Bismuth oxides, bismuthates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. zinc bismuthate ($Zn(BiO_3)_2$)	C04B 2235/3298
The preparation of zinc compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 9/00 and subgroups
The preparation of gallium, indium or thallium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 15/00 and subgroups
The preparation of bismuth compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 29/00 and subgroups
Transparent conductive oxide layers (TCO) being part of a multilayer coating on glass Layers comprising zinc oxide	C03C 2217/944
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: compounds of bismuth and vanadium	C09C 1/0006, C09C 1/0006
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: compounds of zinc	C09C 1/04, C09C 1/04 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing inorganic Zn or Cd compounds	C09K 11/0811, C09K 11/54
Luminescent, e.g. electroluminescent, chemiluminescent materials containing arsenic, antimony or bismuth	C09K 11/74 and subgroups
Obtaining zinc oxide	C22B 19/34, C22B 19/34 and subgroups
Target materials for coating by Physical Vapour Deposition	C23C 14/08
Zinc oxide in machines or engines in general (F01) or machines for liquids (F04)	F05C 2203/0891

Non-adjustable resistors formed as one or more layers or coatings; Non-adjustable resistors made from powdered conducting material or powdered semi-conducting material with or without insulating material having negative temperature coefficient mainly consisting of zinc or cadmium oxide	H01C 7/044
Resistors, e.g. varistors based on ZnO	H01C 7/112, H01C 7/112
Thin film transistors having a semiconductor body comprising an oxide semiconductor material, e.g. zinc oxide, copper aluminium oxide, cadmium stannate	H01L 29/7869
Wideband gap semiconductor comprising zinc oxide, e.g. ZnO	H01L 51/4233, H01L 51/4233
Fuel cells operating at high temperature, e.g. with stabilised ZrO2 electrolyte, the electrolyte consisting of oxides, the electrolyte containing bismuth oxide	H01M 8/1266

Special rules of classification

$Bi_{13}Mn_{13}O_{40}$ is classified in C04B 35/016, $Bi_{13}Fe_{13}O_{40}$ in C04B 35/26, $Bi_{13}Co_{13}O_{40}$ in C04B 35/01, $Bi_{13}Mn_{6.5}Fe_{6.5}O_{40}$ in C04B 35/2658, $Bi_{11}Co_{7.5}Cu_{7.5}O_{40}$ is classified in C04B 35/01 and C04B 35/4521, $Bi_{18.2}Mn_{3.9}Co_{3.9}O_{40}$ is classified in C04B 35/016 and C04B 35/01. None of these compositions is classified in C04B 35/453

C04B 35/457

based on tin oxides or stannates

Definition statement

This place covers:

Ceramics based on the single oxide SnO_2, or on mixed oxides of alkali metal, alkaline earth or rare earth metals with tin oxide. Ceramics based on mixed oxides of gallium or indium with tin, possibly also containing zinc, e.g. indium tin oxide (ITO) or indium tin zinc oxide (ITZO).

References

Limiting references

This place does not cover:

Ceramics based on mixed oxides of indium, tin and zinc containing more zinc than tin.	C04B 35/453

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating ceramic substrates with tin oxide	C04B 41/505
Tin oxides, stannates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g., indium tin oxide (ITO)	C04B 2235/3293
The preparation of tin compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 19/00 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing germanium, tin or lead	C09K 11/66 and subgroups

Thin film transistors having a semiconductor body comprising an oxide semiconductor material, e.g. zinc oxide, copper aluminium oxide, cadmium stannate	H01L 29/7869
Transparent ITO electrodes	H01L 31/022466, H01L 31/1884, H01L 51/442
Transparent conductive oxide layers (TCO) being part of a multilayer coating on glass Layers comprising indium tin oxide (ITO)	**M03C217/598**

C04B 35/46

based on titanium oxide or titanates (containing also zirconium or hafnium oxides, zirconates or hafnates C04B 35/49)

Definition statement

This place covers:

Ceramics based on the single metal oxide phase TiO_2 or on sub-oxides of titanium oxide, e.g. Ti_2O_3. Ceramics based on mixed metal oxides of titanium, the so-called titanates.

References

Limiting references

This place does not cover:

Ceramic compositions based on titanium oxides or titanates, containing also zirconium or hafnium oxides, zirconates or hafnates	C04B 35/49 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone Titanium oxide, e.g. titanates	C04B 14/305
Making fibres based on titanium oxide	C04B 35/62259
Coating or impregnating ceramic substrates with titanium oxides or titanates	C04B 41/5041
Titanium oxides or titanates, e.g. rutile or anatase as additive for making ceramics or as secondary phase in a ceramic	C04B 2235/3232 and subgroups
Refractory metal oxide interlayer used for joining a ceramic with another substrate	C04B 2237/068
Titania or titanate substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/346
Materials for prostheses based on titania or titanium oxide TiO	A61F 2310/00227
Catalysts or catalyst carriers comprising titanium; Oxides or hydroxides thereof	B01J 21/063, B01J 21/063
The preparation of titanium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 23/00 and subgroups

Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: compounds of titanium	C09C 1/36, C09C 1/36 and subgroups
Ceramic insulating or dielectric materials	H01B 3/12
Resistors, e.g. varistors, based on titanium oxide or titanates	H01C 7/115, H01C 7/115
Fixed capacitors containing a ceramic dielectric based on titanium oxides or titanates	H01G 4/1218, H01G 4/1218
Light-sensitive devices comprising an oxide semiconductor electrode comprising titanium oxide, e.g. TiO_2	H01G 9/2031, H01G 9/2031
Manufacture or treatment of semiconductor devices or of parts thereof, forming insulating materials on a substrate, the material containing titanium, e.g. TiO_2	H01L 21/02186, H01L 21/02186
Piezoelectric ceramics	H01L 41/187
Wideband gap semiconductor comprising titanium oxide, e.g. TiO_2	H01L 51/4226, H01L 51/4226
Ceramic dielectric resonators	H01P 7/10

C04B 35/462

based on titanates

Definition statement

This place covers:

Ceramics based on mixed metal oxides of titanium, the so-called titanates.

References

Limiting references

This place does not cover:

Zirconium oxide based ceramics containing also titanium oxides or titanates, e.g. zirconate-titanates such as PZT	C04B 35/49 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics or ceramic mixtures based on vanadium, niobium, tantalum, molybdenum or tungsten oxides or solid solutions thereof with other oxides, e.g. vanadates, niobates, tantalates, molybdates or tungstates containing also lead and also titanates	C04B 35/499
Titanates as additive for making ceramics or as secondary phase in a ceramic	C04B 2235/3234 and subgroup
Zirconates or hafnates containing also titanium oxide or titanates as additive for making ceramics or as secondary phase in a ceramic	C04B 2235/3249
The preparation of titanium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds containing, besides titanium, two or more other elements, with the exception of oxygen or hydrogen	C01G 23/002
The preparation of titanate compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 23/003 and subgroups

Single crystals of Titanates; Germanates; Molybdates; Tungstates	C30B 29/32
Non-adjustable resistors formed as one or more layers or coatings; Non-adjustable resistors made from powdered conducting material or powdered semi-conducting material with or without insulating material having positive temperature coefficient mainly consisting of perovskites, e.g. titanates	H01C 7/025, H01C 7/025
Non-adjustable resistors formed as one or more layers or coatings; Non-adjustable resistors made from powdered conducting material or powdered semi-conducting material with or without insulating material having negative temperature coefficient mainly consisting of perovskites, e.g. titanates	H01C 7/045, H01C 7/045

C04B 35/465

based on alkaline earth metal titanates

Definition statement

This place covers:

Ceramics based on mixed metal oxides of titanium with the alkaline earth metals Mg and/or Ca, e.g. magnesium titanate ($MgTiO_3$) or calcium barium titanate with the formula $Ca_{0.6}Ba_{0.4}TiO_3$

References

Limiting references

This place does not cover:

Zirconium oxide based ceramics containing also titanium oxides or titanates, e.g. alkaline earth zirconate-titanates such as magnesium zirconate titanate	C04B 35/49

Informative references

Attention is drawn to the following places, which may be of interest for search:

Alkaline earth oxides or salts as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3205 and subgroups
Alkaline earth metal titanates as additive for making ceramics or as secondary phase in a ceramic	C04B 2235/3236
The preparation of alkaline earth metal titanate compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 23/006
Fixed capacitors containing a ceramic dielectric based on alkaline earth titanates	H01G 4/1227, H01G 4/1218
Insulating layers on semi-conductor bodies having a perovskite structure	H01L 21/31691
Manufacture of capacitors containing a perovskite dielectric	H01L 28/55 and subgroups

C04B 35/468

based on barium titanates

Definition statement

This place covers:

Ceramics based on mixed metal oxides of barium and titanium, containing more Ba than of any of the other alkaline earth metals, e.g. barium magnesium titanate containing more Ba than Mg.

References

Limiting references

This place does not cover:

Zirconium oxide based ceramics containing also titanium oxides or titanates, e.g. alkaline earth zirconate-titanates such as barium zirconate titanate	C04B 35/49

Informative references

Attention is drawn to the following places, which may be of interest for search:

Barium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3215
Heater elements characterised by the composition or nature of the materials or by the arrangement of the conductor: conductive ceramics, e.g. metal oxides, metal carbides, barium titanate, ferrites, zirconia, vitreous compounds	H05B 3/141 and subgroup

Special rules of classification

Barium titanate normally has the perovskite structure. If the structure of the barium titanate material is not mentioned, it can normally be assumed it is a perovskite. This means that the head-class C04B 35/468 rarely needs to be used.

C04B 35/4682

{based on $BaTiO_3$ perofskite phase}

Definition statement

This place covers:

Ceramics based on mixed metal oxides of barium and titanium, containing more Ba than of any of the other alkaline earth metals, e.g. barium calcium titanate with the formula $Ca_{0.4}Ba_{0.6}TiO_3$ Ceramics based on mixed metal oxides of titanium, the so-called titanates.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics having the perovskite structure, ABO_3	C04B 2235/768

Heater elements characterised by the composition or nature of the materials or by the arrangement of the conductor: conductive ceramics, e.g. metal oxides, metal carbides, barium titanate, ferrites, zirconia, vitreous compounds	H05B 3/141 and subgroup

Special rules of classification

Barium titanate normally has the perovskite structure. If the structure of the barium titanate material is not mentioned, it can normally be assumed it is a perovskite. This means that the head-class C04B 35/468 rarely needs to be used.

C04B 35/4684

{containing lead compounds (C04B 35/472 takes precedence)}

Definition statement

This place covers:

Ceramics based on mixed metal oxides of barium and titanium, containing more Ba than of any of the other alkaline earth metals, and also containing some amount of Pb, e.g. as dopant

References

Limiting references

This place does not cover:

Lead titanate based ceramics	C04B 35/472
Zirconium oxide based ceramics containing also titanium oxides or titanates, e.g. alkaline earth lead zirconate-titanates such as barium containing PZT	C04B 35/491

Informative references

Attention is drawn to the following places, which may be of interest for search:

Lead oxides, plumbates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. silver plumbate ($Ag_5Pb_2O_6$)	C04B 2235/3296

C04B 35/4686

{based on phases other than $BaTiO_3$ perofskite phase}

Definition statement

This place covers:

Barium titanate normally has the perovskite structure. If the structure of the barium titanate material is not mentioned, it can normally be assumed it is a perovskite. Other barium titanate phases are $BaTi_4O_9$ and $Ba_2Ti_9O_{20}$.

References

Limiting references

This place does not cover:

Zirconium oxide based ceramics containing also titanium oxides or titanates, e.g. alkaline earth zirconate-titanates such as barium zirconate titanate	C04B 35/49

C04B 35/4688

{containing lead compounds (C04B 35/472 takes precedence)}

Definition statement

This place covers:

Ceramics based on mixed metal oxides of barium and titanium, containing more Ba than of any of the other alkaline earth metals, and also containing some amount of Pb, e.g. as dopant

References

Limiting references

This place does not cover:

Lead titanate based ceramics	C04B 35/472
Zirconium oxide based ceramics containing also titanium oxides or titanates, e.g. alkaline earth lead zirconate-titanates such as barium containing PZT	C04B 35/491

Informative references

Attention is drawn to the following places, which may be of interest for search:

Lead oxides, plumbates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. silver plumbate ($Ag_5Pb_2O_6$)	C04B 2235/3296

Special rules of classification

Barium titanate normally has the perovskite structure. If the structure of the barium titanate material is not mentioned, it can normally be assumed it is a perovskite. Other barium titanate phases are not common.

C04B 35/47

based on strontium titanates

Definition statement

This place covers:

Ceramics based on alkaline earth metal titanates, containing more Sr than of any other alkaline earth metal, e.g. $Ba_{0.45}Ca_{0.05}Sr_{0.50}TiO_3$

References

Limiting references

This place does not cover:

Zirconium oxide based ceramics containing also titanium oxides or titanates, e.g. alkaline earth zirconate-titanates such as strontium zirconate-titanate	C04B 35/49 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Strontium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3213

C04B 35/472

based on lead titanates

Definition statement

This place covers:

Ceramics based on titanates, containing more Pb in the titanate phase than of any other metal ion, except for titanium, e.g. $Al_{0.45}Pb_{0.55}TiO_3$

References

Limiting references

This place does not cover:

Barium titanate perovskite containing lead compounds based ceramic	C04B 35/4684
Barium titanate containing lead compounds non-perovskite phase based ceramic	C04B 35/4688
Zirconium oxide based ceramics containing also titanium oxides or titanates, e.g. lead zirconate-titanates such PZT	C04B 35/491 and subgroup

Informative references

Attention is drawn to the following places, which may be of interest for search:

Lead oxides, plumbates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. silver plumbate ($Ag_5Pb_2O_6$)	C04B 2235/3296
Ceramic compositions for piezo-electric or electrostrictive devices	H01L 41/187

C04B 35/475

based on bismuth titanates

Definition statement

This place covers:

Ceramics based on titanates, containing more Bi in the titanate phase than of any other metal ion, except for titanium, e.g. $Pb_{0.3}Al_{0.3}Bi_{0.4}TiO_3$

References

Limiting references

This place does not cover:

Zirconium oxide based ceramics containing also titanium oxides or titanates, e.g. bismuth zirconate-titanate	C04B 35/49

Informative references

Attention is drawn to the following places, which may be of interest for search:

Bismuth oxides, bismuthates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. zinc bismuthate ($Zn(BiO_3)_2$)	C04B 2235/3298

C04B 35/478

based on aluminium titanates

Definition statement

This place covers:

Ceramics based on titanates, containing more Al in the titanate phase than of any other metal ion, except for titanium, e.g. $Al_{0.3}Pb_{0.2}Bi_{0.2}Ba_{0.2}La_{0.1}TiO_3$

References

Limiting references

This place does not cover:

Zirconium oxide based ceramics containing also titanium oxides or titanates, e.g. aluminium zirconate-titanate	C04B 35/49

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramic honeycombs, e.g. aluminum titanate honeycombs	C04B 38/0006
Aluminium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. bauxite, alpha-alumina	C04B 2235/3217 and subgroups
Honeycomb filter for exhaust apparatus	F01N 3/0222
Aluminium titanate in machines or engines in general (F01) or machines for liquids (F04)	F05C 2203/0878

C04B 35/48

based on zirconium or hafnium oxides, zirconates, {zircon} or hafnates

Definition statement

This place covers:

All ceramic materials having a zirconia phase or zirconate phase as the largest fraction, e.g. yttria-stabilised-zirconia, monoclinic zirconia, lanthanum zirconate

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: zirconium oxide	C04B 14/306
Making fibres based on zirconium oxide	C04B 35/6225
Coating or impregnating ceramic substrates with zirconium oxides or zirconates, hafnium oxides or hafnates	C04B 41/5042 and subgroup
Zirconium or hafnium oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. HfO_2	C04B 2235/3244 and subgroups
Refractory oxide interlayer used for joining a ceramic with another substrate	C04B 2237/068
Zirconia, hafnia, zirconate or hafnate substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/348
Materials for prostheses based on zirconia or zirconium oxide	A61F 2310/00239
Materials for prostheses based on hafnia or hafnium oxide	A61F 2310/00251
Catalysts comprising Zirconium or hafnium; Oxides or hydroxides thereof	B01J 21/066, B01J 21/066
The preparation of zirconium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 25/00 and subgroups
Zirconium oxide in machines or engines in general (F01) or machines for liquids (F04)	F05C 2203/0895
Fixed capacitors containing a ceramic dielectric based on zirconium oxides or zirconates	H01G 4/1236, H01G 4/1236
Manufacture or treatment of semiconductor devices or of parts thereof, forming insulating materials on a substrate, the material containing hafnium, e.g. HfO_2	H01L 21/02181, H01L 21/02181, H01L 21/31645, H01L 21/31645 (from the gas phase)
Manufacture or treatment of semiconductor devices or of parts thereof, forming insulating materials on a substrate, the material containing zirconium, e.g. ZrO_2	H01L 21/02189, H01L 21/02189, H01L 21/31641, H01L 21/31641 (from the gas phase)

Heater elements characterised by the composition or nature of the materials or by the arrangement of the conductor: conductive ceramics, e.g. metal oxides, metal carbides, barium titanate, ferrites, zirconia, vitreous compounds	H05B 3/141 and subgroup

Special rules of classification

The head group C04B 35/48 only contains non-refractories of zirconia and/or zirconate with large grain sizes of at least 0,1 mm.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

YSZ	Yttria-stabilised zirconia
3Y-TZP	Zirconia partially stabilised in the tetragonal phase by 3 mol% yttria

C04B 35/481

{containing silicon, e.g. zircon}

Definition statement

This place covers:

Zirconates containing silica, such as zircon ($ZrSiO_4$), zirconia ceramics containing a silica or silicate binder, zirconia refractories containing quartz

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: zircon	C04B 14/046
Alumina based refractories containing zircon	C04B 35/106
Alumina based refractories containing zircon, made by melt-casting	C04B 35/109
Zirconates or hafnates as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. zircon ($ZrSiO_4$)	C04B 2235/3248
Silica as starting material for making a ceramic or as secondary phase of a sintered ceramic	C04B 2235/3418

Special rules of classification

Documents that are classified in C04B 35/481 can also be classified in other sub-groups of C04B 35/48, e.g. a zirconia refractory containing quartz is classified in both C04B 35/481 and C04B 35/482. A fine ceramic containing as major phase zircon and having at least one secondary phase is also classified in C04B 35/488. Classification in C04B 35/486 is not necessary, if the silica-containing zirconia ceramic is a fine ceramic with grain sizes below 100 microns. In practice C04B 35/482, C04B 35/484, C04B 35/488 and C04B 35/4885 are used in combination with **C04B35/48A**.

Zircon is in principle the only silicate that is not classified as a silicate, but is classified according to the other metal cation(s) present in the silicate.

C04B 35/482

Refractories from grain sized mixtures

Definition statement

This place covers:

Zirconia based refractories having large grains, the majority larger than 100 microns

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Grain-sized magnesia-based refractories	C04B 35/043 and subgroups
Grain-sized alumina-based refractories	C04B 35/101 and subgroups
Grain-sized alumina-based refractories, containing zirconia or zircon	C04B 35/106
Grain-sized titania-based refractories	C04B 35/46 and C04B 35/66
Grain-sized silicon carbide-based refractories	C04B 35/565 and subgroups, and **C04B45/66**
Monolithic refractories and refractory mortars	C04B 35/66
Using particles larger than 100 microns for making the ceramic	C04B 2235/5427
Bimodal, multi-modal or multi-fraction particle size distribution	C04B 2235/5472
Compositions of refractory mould or core materials; Grain structures thereof	B22C 1/00 and subgroups
Abrasive particles per se obtained by division of a mass agglomerated by sintering	C09K 3/1418

C04B 35/484

Refractories by fusion casting

Definition statement

This place covers:

Refractories that are used directly after melting, either in particle or bulk form, as well as fused refractory that is sintered before use as refractory

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Clay wares made by methods involving melting, fusion or softening	C04B 33/323

Magnesia-based refractories made by fusion casting	C04B 35/05 and subgroup
Alumina-based refractories made by fusion casting	C04B 35/107 and subgroup
Alumina-based refractories made by fusion casting, containing zirconia or zircon	C04B 35/109
Fusing to make ceramic particles in general	C04B 35/62665
Refractories in general made by fusion casting	C04B 35/657
Heat treatments such as] Calcining; Fusing Pyrolysis in general	B01J 6/00 and subgroups

C04B 35/486

Fine ceramics

Definition statement

This place covers:

All ceramic materials having a zirconia phase or zirconate phase as the largest fraction, e.g. yttria-stabilised-zirconia, monoclinic zirconia, lanthanum zirconate, where the major phase has an average grain size of below 100 micron

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Using particles of size 1-100 microns for making the ceramic	C04B 2235/5436
Protective coatings for engine blades	F01D 5/288
Fuel cells operating at high temperature, e.g. with stabilised ZrO_2 electrolyte, the electrolyte consisting of oxides, the electrolyte containing zirconium oxide	H01M 8/1253, H01M 8/1253

C04B 35/488

Composites

Definition statement

This place covers:

All ceramic materials having a zirconia phase or zirconate phase as the largest fraction, e.g. yttria-stabilised-zirconia, monoclinic zirconia, lanthanum zirconate, but containing also at least one secondary phase, which is not a grain boundary phase. This secondary phase normally is another ceramic phase, but could also be a metallic non-continuous phase. The composite can also be a mixture of a zirconia and a zirconate phase or of two different zirconate phases.

References

Limiting references

This place does not cover:

Zirconia refractories containing a secondary phase	C04B 35/482

Mixtures of different zirconia phases, e.g. a mixture of cubic and tetragonal zirconia or a mixture of tetragonal and monoclinic zirconia	C04B 35/486

Informative references

Attention is drawn to the following places, which may be of interest for search:

Zirconia ceramics containing shaped metallic materials, e.g. metallic fibers	C04B 35/74 and subgroup
Zirconia ceramics containing ceramic fibers, whiskers or platelets, e.g. an zirconia particle matrix containing alumina fibers or alumina platelets	C04B 35/803 and additional symbols (CCA) for the fibers, whiskers, platelets
Ceramics containing one or more secondary phases	C04B 2235/80 and subgroups

Special rules of classification

If the secondary phase is a ceramic fiber, whisker, platelet or similarly shaped ceramic particle, both C04B 35/803 and C04B 35/488 are given. The same logic applies to C04B 35/488 and C04B 35/74.

The secondary phases are indicated with symbols from C04B 2235/32-C04B 2235/428. The symbol C04B 2235/80 does not need to be used, since the class itself already indicates that secondary phases are present.

C04B 35/4885

{with aluminium oxide}

Definition statement

This place covers:

All sintered zirconia ceramics that contain at least one secondary alumina phase, where this secondary alumina phase is not a grain boundary phase

References

Limiting references

This place does not cover:

Zirconia refractories containing an alumina secondary phase	C04B 35/482, C04B 35/484

Informative references

Attention is drawn to the following places, which may be of interest for search:

Alumina-based ceramics containing a zirconia secondary phase	C04B 35/119
Aluminium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. bauxite, alpha-alumina	C04B 2235/3217 and subgroups

Special rules of classification

If the amount of zirconia phase is larger than the amount of alumina phase, C04B 35/4885 is given, if the amounts are equal, e.g. **C04B40/40**, then both C04B 35/119 and C04B 35/4885 are given.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

ZTA	Zirconia toughened alumina
ATZ	Alumina toughened zirconia

C04B 35/49

containing also titanium oxides or titanates

Definition statement

This place covers:

Titanium-zirconates, zirconium-titanates, titanate-zirconates, for instance barium zirconate-titanate, mixed oxides containing at least zirconia and titania.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Titanates	C04B 35/462 and subgroups
Titanium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. rutile or anatase	C04B 2235/3232 and subgroups
Titanate as starting material for making ceramics or as secondary phase of a sintered ceramic, not containing zirconium, e.g. aluminium titanate (Al_2TiO_5) or mixed niobate-titanates	C04B 2235/3234 and subgroup.
Zirconates or hafnates containing also titanium oxide or titanates as starting material for making ceramics or as secondary phase in a ceramic, e.g. lead zirconate titanate (PZT, $PbTi_{1-x}Zr_xO_3$).	C04B 2235/3249
Ceramic insulating or dielectric materials	H01B 3/12
Resistors, e.g. varistors, based on metal oxides	H01C 7/108
Fixed capacitors containing a ceramic dielectric based on zirconium oxides containing also titanates	H01G 4/1245, H01G 4/1245
Piezoelectric ceramics	H01L 41/187
Ceramic dielectric resonators	H01P 7/10

Special rules of classification

If the amount of ZrO_2 is quite small, e.g. $BaTiO_3$ with only 1 wt% of zirconia dopant, then both C04B 35/49 and C04B 35/4682 are given.

C04B 35/491

based on lead zirconates and lead titanates, {e.g. PZT}

Definition statement

This place covers:

Lead zirconate titanate, doped possibly with other elements such as La.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Lead titanate based ceramics	C04B 35/472
Lead zirconate based ceramics	C04B 35/486
Lead oxides, plumbates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. silver plumbate ($Ag_5Pb_2O_6$)	C04B 2235/3296
Ceramic probes, e.g. lead zirconate titanate (PZT) probes	G01N 29/245
Insulating layers on semi-conductor bodies having a perovskite structure	H01L 21/31691
Manufacture of capacitors containing a perovskite dielectric	H01L 28/55 and subgroups
Piezo-electric devices; Electrostrictive devices; Magnetostrictive devices; Processes or apparatus peculiar to the manufacture or treatment thereof or of parts thereof; Details thereof of devices of ceramic compositions	**H01L41/24**

Special rules of classification

These materials normally have a perovskite structure. C04B 2235/768 can be added to indicate the presence of a perovskite structure.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

PLZT	Lead zirconate titanate doped with lanthanum

C04B 35/493

containing also other lead compounds

Definition statement

This place covers:

PZT doped for instance with Mg, Nb, Ni or other elements that take the B position in the ABO_3 perovskite structure of PZT, while the A-position is taken by Pb

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Lead titanate	C04B 35/472

Lead niobate titanate (zirconate)	C04B 35/499
Magnesium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3206
Niobates or tantalates as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. silver niobate ($AgNbO_3$)	C04B 2235/3255

Special rules of classification

These materials normally have a perovskite structure, ABO_3. C04B 2235/768 can be added to indicate the presence of a perovskite structure. If there is any element at the B-position that is present in an amount larger than Zr and Ti together, then the material is classified in the class of this element, e.g. $PbNb_{0.4}Ti_{0.3}Zr_{0.3}$ is classified in C04B 35/493, but $PbNb_{0.55}Ti_{0.3}Zr_{0.15}$ is classified in C04B 35/499. $PbAl_{0.4}Ti_{0.1}Zr_{0.5}$ is classified in C04B 35/493, but $PbAl_{0.55}Ti_{0.1}Zr_{0.35}$ is classified in C04B 35/44. $PbNb_{0.4}Mg_{0.05}Ti_{0.1}Zr_{0.45}$ is also classified in C04B 35/493, since Ti and Zr together form the largest fraction of B-atoms. $PbNb_{0.3}W_{0.25}Zr_{0.4}Ti_{0.05}$ is classified in C04B 35/499 though, since Nb and W together form a larger fraction than Zr and Ti together.

C04B 35/495

based on vanadium, niobium, tantalum, molybdenum or tungsten oxides or solid solutions thereof with other oxides, e.g. vanadates, niobates, tantalates, molybdates or tungstates

Definition statement

This place covers:

Ceramics based on the single metal oxide phase Nb_2O_5, Ta_2O_5, MoO_x, WO_x, V_2O_5 or on sub-oxides such as niobium suboxide. Ceramics based on mixed metal oxides of V, Nb, Ta, Mo or W.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on titanium oxide or titanates	C04B 35/46 and subgroups
Ceramics based on titanium oxide or titanates containing also zirconium or hafnium oxides, zirconates or hafnates	C04B 35/49 and subgroups
Coating or impregnating ceramic substrates with niobium oxides or niobates	C04B 41/5051
Vanadium oxides, vanadates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. magnesium vanadate ($Mg_2V_2O_7$).	C04B 2235/3239
Niobium or tantalum oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Nb_2O_5 or Ta_2O_5	C04B 2235/3251 and subgroups
Molybdenum oxides, molybdates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. cadmium molybdate ($CdMoO_4$)	C04B 2235/3256
Tungsten oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. scheelite ($CaWO_4$)	C04B 2235/3258 and subgroup

Refractory metal oxide interlayer used for joining a ceramic with another substrate	C04B 2237/068
Refractory metal oxide substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/345
Materials for prostheses based on tantalum oxide	A61F 2310/00257
Catalysts comprising metals or metal oxides or hydroxides of vanadium	B01J 23/22
Catalysts comprising metals or metal oxides or hydroxides of molybdenum	B01J 23/28
Catalysts comprising metals or metal oxides or hydroxides of tungsten	B01J 23/30
The preparation of vanadium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 31/00 and subgroups
The preparation of niobium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 33/00 and subgroups
The preparation of tantalum compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 35/00 and subgroups/
The preparation of molybdenum compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 39/00 and subgroups
The preparation of tungsten compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 41/00 and subgroups/
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: compounds of molybdenum	C09C 1/0003, C09C 1/0003
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: compounds of bismuth and vanadium	C09C 1/0006, C09C 1/0006
Luminescent, e.g. electroluminescent, chemiluminescent materials containing vanadates	C09K 11/085
Luminescent, e.g. electroluminescent, chemiluminescent materials containing chromium, molybdenum or tungsten	C09K 11/68 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing vanadium	C09K 11/69 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing arsenic, antimony or bismuth vanadates; Chromates; Molybdates; Tungstates	C09K 11/7457, C09K 11/758
Luminescent, e.g. electroluminescent, chemiluminescent materials containing rare earth vanadates; Chromates; Molybdates; Tungstates	C09K 11/7708, C09K 11/7722, C09K 11/7736, C09K 11/7751, C09K 11/7765, C09K 11/7776, C09K 11/7794
Single crystals of Niobates; Vanadates; Tantalates	C30B 29/30
Single crystals of Titanates; Germanates; Molybdates; Tungstates	C30B 29/32
Non-adjustable resistors formed as one or more layers or coatings; Non-adjustable resistors made from powdered conducting material or powdered semi-conducting material with or without insulating material having positive temperature coefficient mainly consisting of Vanadium oxides or oxidic compounds, e.g. VOx	H01C 7/026, H01C 7/026

Non-adjustable resistors formed as one or more layers or coatings; Non-adjustable resistors made from powdered conducting material or powdered semi-conducting material with or without insulating material having negative temperature coefficient mainly consisting of Vanadium oxides or oxidic compounds, e.g. VOx	H01C 7/047, H01C 7/047
Fixed capacitors containing a ceramic dielectric based on niobium or tungsten, tantalum oxides or niobates, tantalates	H01G 4/1254, H01G 4/1254 and subgroup
Manufacture or treatment of semiconductor devices or of parts thereof, forming insulating materials on a substrate, the material containing tantalum, e.g. Ta_2O_5	H01L 21/02183, H01L 21/02183, H01L 21/31645, H01L 21/31645 (from the gas phase)
Ceramic compositions for piezo-electric or electrostrictive devices	H01L 41/187
Details of surface acoustic wave devices of lithium niobate or lithium-tantalate substrates	H03H 9/02559, H03H 9/02559
Materials for prostheses based on niobium oxide	**K61F2/00A6B2N**

C04B 35/497

based on solid solutions with lead oxides

Definition statement

This place covers:

Lead niobate ($PbNbO_3$), tantalate, etc., possibly doped with other elements such as Mg, Ni, Zr, Fe

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Lead titanate	C04B 35/472
Lead zirconate	C04B 35/486 and subgroups
Lead titanate zirconate	C04B 35/491 and subgroup
Lead oxides, plumbates or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. silver plumbate ($Ag_5Pb_2O_6$)	C04B 2235/3296

C04B 35/499

containing also titanates

Definition statement

This place covers:

PZT-like material for instance with large amount of Nb, more than the amount of Ti and Zr together.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating ceramic substrates with niobium oxides or niobates	C04B 41/5051
Titanate as starting material for making ceramics or as secondary phase of a sintered ceramic, not containing zirconium, e.g. aluminium titanate (Al_2TiO_5) or mixed niobate-titanates	C04B 2235/3234 and subgroup
The preparation of vanadium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, compounds containing, besides vanadium, two or more other elements, with the exception of oxygen or hydrogen	C01G 31/006
The preparation of niobium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, compounds containing, besides niobium, two or more other elements, with the exception of oxygen or hydrogen	C01G 33/006
The preparation of tantalum compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, compounds containing, besides tantalum, two or more other elements, with the exception of oxygen or hydrogen	C01G 35/006
The preparation of molybdenum compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, compounds containing, besides molybdenum, two or more other elements, with the exception of oxygen or hydrogen	C01G 39/006
The preparation of tungsten compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, compounds containing, besides tungsten, two or more other elements, with the exception of oxygen or hydrogen	C01G 41/006

Special rules of classification

These materials normally have a perovskite structure, ABO_3. C04B 2235/768 can be added to indicate the presence of a perovskite structure. If the combined amount of Nb/Ta/W/Mo/V is lower than the combined amount of Zr and Ti, then the material is classified in C04B 35/00-C04B 35/493, e.g. $PbNb_{0.4}Ti_{0.3}Zr_{0.3}$ is classified in C04B 35/493, but $PbNb_{0.55}Ti_{0.3}Zr_{0.15}$ is classified in C04B 35/499. $PbAl_{0.4}Ti_{0.1}Zr_{0.5}$ is classified in C04B 35/493, but $PbAl_{0.55}Ti_{0.1}Zr_{0.35}$ is classified in C04B 35/44. $PbNb_{0.4}Mg_{0.05}Ti_{0.1}Zr_{0.45}$ is also classified in C04B 35/493, since Ti and Zr together form the largest fraction of B-atoms. $PbNb_{0.3}W_{0.25}Zr_{0.4}Ti_{0.05}$ is classified in C04B 35/499 though, since Nb and W together form a larger fraction than Zr and Ti together.

C04B 35/50

based on rare-earth compounds {(non-oxide rare earth compounds C04B 35/5156)}

Definition statement

This place covers:

Ceramic materials containing as the largest fraction a phase consisting out of rare earth oxides or out of mixtures of rare earth oxides with alkali metals or alkaline earth metals, e.g. gadolinium cerate, $Gd_xCe_{1-x}O_3$, barium cerate, $BaCeO_3$, magnesium lanthanate, $MgLaO_3$, yttrium scandium oxide, $YScO_x$ (also classified C04B 35/505). Ceramic materials containing a mixture of rare earth metals and

zirconia and/or hafnia, where the amount of rare earth metals is higher than the amount of zirconia, e.g. $Ce_{0.3}La_{0.3}Zr_{0.4}O_x$.

References

Limiting references

This place does not cover:

Mixed oxides of rare earth metals with silica without alumina	C04B 35/16
Mixed oxides of rare earth metals with both alumina and silica	C04B 35/18
Mixed oxides of rare earth metals with iron oxides and possible other metal oxides, e.g. ferrites	C04B 35/2608 and subgroups, C04B 35/2641, C04B 35/2675
Mixed oxides of rare earth metals with chromium oxide, e.g. lanthanum chromites	C04B 35/42
Mixed oxides of rare earth metals with alumina, without silica, e.g. scandium aluminate	C04B 35/44
Rare earth phosphates	C04B 35/447
Mixed oxides of rare earth metals with copper oxide, e.g. superconducting LaBa-cuprate	C04B 35/4504 and subgroup
Mixed oxides of rare earth metals with zinc oxide and/or bismuth oxide, e.g. dysprosium bismuthate	C04B 35/453
Mixed oxides of rare earth metals with tin oxide, e.g. neodymium stannate	C04B 35/457
Mixed oxides of rare earth metals with titanium oxides, such as lanthanum titanate or cerium titanate	C04B 35/462
Mixed oxides of rare earth metals with zirconium oxide, e.g. cerium zirconate, containing more Zr than rare earth metals	C04B 35/48 and subgroups
Mixed oxides of rare earth metals with zirconium oxide and titanium oxide, e.g. ytterbium titanate zirconate ($YbTi_{0.5}Zr_{0.5}O_3$)	C04B 35/49 and subgroups
Mixed oxides of rare earth metals with vanadium oxide and/or niobium oxide and/or molybdenum oxide and/or tungsten oxide and/or tantalum oxide, e.g. erbium tantalum niobate ($ErNb_{0.5}Ta_{0.5}O_3$)	C04B 35/495 and subgroups
Ceramics based on non-oxide rare earth compounds	C04B 35/5156
Rare earth oxide interlayer used for joining a ceramic with another substrate	C04B 2237/066

Informative references

Attention is drawn to the following places, which may be of interest for search:

Rare earth non-oxide ceramics	C04B 35/5156
Coating or impregnating ceramic substrates with rare earth oxides	C04B 41/5045
Rare earth oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Sc_2O_3, Lu_2O_3, Nd_2O_3	C04B 2235/3224
Catalysts comprising metals or metal oxides or hydroxides of rare earths	B01J 23/10
The preparation of rare earth compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01F 17/00 and subgroups

Luminescent materials containing rare earth metals	C09K 11/77 and subgroups, C09K 11/0822
Light filters; Selection of luminescent materials for light screens	F21V 9/16
Scintillation detectors	G01T 1/20, G01T 3/06
Luminescent screens	H01J 1/63
Manufacture or treatment of semiconductor devices or of parts thereof, forming insulating materials on a substrate, the material containing at least one rare earth metal element, e.g. oxides of lanthanides, scandium or yttrium	H01L 21/02192, H01L 21/02192
Fuel cells operating at high temperature, e.g. with stabilised ZrO_2 electrolyte, the electrolyte consisting of oxides, the electrolyte containing cerium oxide	H01M 8/126, H01M 8/126

Special rules of classification

If any of cerium or lanthanum oxide is present, C04B 2235/3229 (Ce) or C04B 2235/3227 (La) is used. C04B 2235/3224 does not need to be given, if C04B 35/50 is given for a certain composition.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Rare earth oxides	The oxides of scandium (Sc), yttrium (Y), lutetium (Lu), lanthanum (La), cerium (Ce), praseodymium (Pr), neodymium (Nd), promethium (Pm), samarium (Sm), europium (Eu), gadolinium (Gd), terbium (Tb), dysprosium (Dy), holmium (Ho), erbium (Er), thulium (Tm), ytterbium (Yb)

C04B 35/505

based on yttrium oxide

Definition statement

This place covers:

Ceramic materials containing as the largest fraction a phase consisting out of yttria or out of mixtures of yttria with other rare earth oxides, where yttria forms the largest fraction, e.g. yttrium scandium oxide, YScOx (also classified in C04B 35/50). Ceramic materials containing as the largest fraction a phase that is a mixture of yttria with alkali metals or alkaline earth metals. Ceramic materials containing a mixture of yttria and zirconia and/or hafnia, where the amount of yttria is higher than the amount of zirconia, e.g. Y0.6Zr0.4Ox.

References

Limiting references

This place does not cover:

Mixed oxides of yttrium with silica without alumina	C04B 35/16
Mixed oxides of yttrium with both alumina and silica	C04B 35/18
Mixed oxides of yttrium with iron oxides and possible other metal oxides, e.g. ferrites	C04B 35/2608 and subgroups, C04B 35/2641, C04B 35/2675

Mixed oxides of yttrium with chromium oxide, e.g. chromites	C04B 35/42
Mixed oxides of yttrium with alumina, without silica, e.g. yttrium aluminium garnet (YAG, $Y_3Al_5O_{12}$)	C04B 35/44
Yttrium phosphates	C04B 35/447
Mixed oxides of yttrium with copper oxide, e.g. superconducting LaBa-cuprate	C04B 35/4504 and subgroup
Mixed oxides of yttrium with zinc oxide and/or bismuth oxide	C04B 35/453
Mixed oxides of yttrium with tin oxide	C04B 35/457
Mixed oxides of yttrium with titanium oxides	C04B 35/462
Mixed oxides of yttrium with zirconium oxide, containing more Zr than yttrium, e.g. YSZ, yttria-stabilised-zirconia	C04B 35/48 and subgroups
Mixed oxides of yttrium with zirconium oxide and titanium oxide	C04B 35/49 and subgroups
Mixed oxides of yttrium with vanadium oxide and/or niobium oxide and/or molybdenum oxide and/or tungsten oxide and/or tantalum oxide	C04B 35/495 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Rare earth non-oxide ceramics	C04B 35/5156
Yttrium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3225

C04B 35/51

based on compounds of actinides ({non-oxide actinide compounds C04B 35/5158} ; nuclear fuel materials G21C 3/62)

Definition statement

This place covers:

Ceramics having as the largest fraction an oxide based on actinides, e.g. uranium oxide

References

Limiting references

This place does not cover:

Non-oxide actinide ceramics, e.g. uranium carbide	C04B 35/5158

Informative references

Attention is drawn to the following places, which may be of interest for search:

Actinide oxides, mixed metal oxides or oxide forming salts thereof, e.g. carbonates, nitrates, (oxy)hydroxides, chlorides, as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/32
Catalysts comprising metals or metal oxides or hydroxides of actinides	B01J 23/12, B01J 23/12, C07C 2523/12

Compounds of thorium	C01F 15/00
The preparation of uranium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 43/00 and subgroups
The preparation of transuranic element compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 56/00 and subgroups
Ceramic nuclear fuel materials	G21C 3/62 and subgroups

C04B 35/515

based on non-oxide ceramics

Definition statement

This place covers:

Ceramics having as the largest fraction a non-oxide material, e.g. a carbide, nitride, boride, silicide, fluoride, sulphide, selenide.

References

Limiting references

This place does not cover:

Non-oxide ceramics having a metallic binder	C22C 29/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Making fibres based on non-oxide ceramic material	C04B 35/62272
Ceramic products containing macroscopic reinforcing agents containing non-metallic materials: fibres, filaments, whiskers, platelets, or the like: the matrix of the ceramic products consisting of non-oxides only	C04B 35/806
Coating or impregnating ceramic substrates with non-oxide ceramics	C04B 41/5053
Non-oxides as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/38 and subgroups
Non-oxide interlayer used for joining a ceramic with another substrate	C04B 2237/08 and subgroup
Non-oxide substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/36 and subgroups
Non-oxide glass compositions, e.g. binary or ternary halides, sulphides or nitrides of germanium, selenium or tellurium	C03C 3/32, C03B 2201/80 and subgroups
Non-oxide coatings on glass	C03C 17/3429 and subgroups
Non-oxide ceramics in MACHINES OR ENGINES IN GENERAL (F01) OR machines for liquids (F04)	F05C 2203/0804 and subgroups

C04B 35/5152

{based on halogenides other than fluorides}

Definition statement

This place covers:

Sintered ceramics having as the largest fraction a chloride, bromide or iodide phase, or a mixture of these phases

References

Limiting references

This place does not cover:

Starting powder mixtures based on halogenides used to make ceramics	C04B 2235/444

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating ceramic substrates with salts or salty compositions: containing halogen in the anion	C04B 41/5011
Halogens per se	C01B 7/00, C01B 9/00, C01B 11/00 and subgroups
Halides of sodium, potassium or alkali metals in general	C01D 3/00 and subgroups
Halide glasses other than fluoride glasses, i.e. Cl, Br or I glasses, e.g. AgCl-AgBr "glass"	C03B 2201/84

C04B 35/5154

{based on phosphides}

Definition statement

This place covers:

Sintered ceramics having as the largest fraction a phosphide phase. Phosphides are metal-phosphor compounds that do not contain oxygen.

References

Limiting references

This place does not cover:

Phosphate ceramics, metal-phosphor-oxygen compounds	C04B 35/447

Informative references

Attention is drawn to the following places, which may be of interest for search:

Metal salts chosen for the nature of the anions as starting material for making ceramics, e.g. phosphides, hydrides, acetylacetonate, hydroxides, or present as secondary phase in the sintered ceramic	C04B 2235/44 and subgroups

Preparation of phosphides per se, e.g. phosphide powder, not preparative to making a phosphide ceramic	C01B 25/08 and subgroups
Boride or phosphide coating on glass	C03C 2217/283
Luminescent, e.g. electroluminescent, chemiluminescent materials containing phosphides	C09K 11/0883, C09K 11/7492
Single crystals based on gallium phosphide	C30B 29/44
Forming inorganic semiconducting materials on a substrate, the substrate being a phosphide	H01L 21/02392, H01L 21/02392
Phosphides used as active substance in electrodes for fuel cells and batteries	H01M 4/5805

C04B 35/5156

{based on rare earth compounds}

Definition statement

This place covers:

Sintered ceramics having as the largest fraction a rare earth non-oxide phase, e.g., a lanthanum carbide, yttrium nitride, cerium boride, scandium silicide, dysprosium fluoride

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Rare earth oxide based ceramics	C04B 35/50
Yttrium oxide based ceramics	C04B 35/505
Ceramics or ceramic mixtures based on carbides, e.g. rare earth carbides	C04B 35/56
Ceramics or ceramic mixtures based on nitrides, e.g. rare earth nitrides	C04B 35/58
Ceramics or ceramic mixtures based on borides, e.g. rare earth borides	C04B 35/5805
Borides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. rare earth boride	C04B 2235/3804
Carbides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. rare earth carbide	C04B 2235/3817
Nitrides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. oxynitrides, carbonitrides, oxycarbonitrides, lithium nitride (Li_3N), magnesium nitride (Mg_3N_2), rare earth nitride	C04B 2235/3852
Metal as starting material for making ceramics or as secondary phase of a sintered ceramic, not being present as a binding phase, e.g. La, Y, Mn, Re, Zn, Ga, In, Ge, Sb, Pb, Bi	C04B 2235/40 and subgroups
The preparation of nitride powders per se, not preparative to the making of nitride ceramics, with one or more rare earth metals	C01B 21/0627, C01B 21/0627

Special rules of classification

The documents classified in this class are also classified in the class of the specific type of non oxide, e.g. lanthanum carbide is classified in C04B 35/5156 and C04B 35/56, cerium nitride is classified in C04B 35/5156 and C04B 35/58.

C04B 35/5158

{based on actinide compounds}

Definition statement

This place covers:

The synthesis of actinide carbides, nitrides, borides, silicides, fluorides, sulphides, selenides

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Actinide oxide based ceramics	C04B 35/51
Ceramics or ceramic mixtures based on carbides, e.g. actinide carbides	C04B 35/56
Ceramics or ceramic mixtures based on nitrides, e.g. actinide nitrides	C04B 35/58
Ceramics or ceramic mixtures based on borides, e.g. actinide borides	C04B 35/5805
Borides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. actinide boride	C04B 2235/3804
Carbides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. actinide carbide	C04B 2235/3817
Nitrides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. oxynitrides, carbonitrides, oxycarbonitrides, lithium nitride (Li_3N), magnesium nitride (Mg_3N_2), actinide nitride	C04B 2235/3852
Metal as starting material for making ceramics or as secondary phase of a sintered ceramic, not being present as a binding phase, e.g. La, Y, Mn, Re, Zn, Ga, In, Ge, Sb, Pb, Bi, U, Pt	C04B 2235/40 and subgroups
The preparation of nitride powders, with one or more actinides, e.g. UN, PuN	C01B 21/063, C01B 21/063
The preparation of actinide carbide powders	C01B 31/306
Ceramic nuclear fuel materials	G21C 3/62 and subgroups

Special rules of classification

The documents classified in this class are also classified in the class of the specific type of non oxide, e.g. uranium carbide is classified in C04B 35/5158 and C04B 35/56, plutonium nitride is classified in C04B 35/5158 and C04B 35/58.

C04B 35/52

based on carbon, e.g. graphite

Definition statement

This place covers:

All inorganic objects containing as largest fraction an inorganic carbon phase or carbon-based mixtures used for making carbon-based bodies or other ceramic objects, e.g. sintered carbon electrodes, characterised by their composition or their synthesis

References

Limiting references

This place does not cover:

Ceramics or ceramic mixtures based on carbides	C04B 35/56 and subgroups
A carbon-based matrix containing carbon fibers	C04B 35/83
Diamond bodies containing a metallic binder	C22C 26/00
Carbon electrodes used in electrolytic capacitors, rectifiers, detectors, switching devices, light-sensitive or temperature-sensitive devices	H01G 9/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Oxide-based ceramics or ceramic mixtures in general containing carbon	C04B 35/013
Alumina-based refractories containing carbon	C04B 35/103
Ceramic powders coated with carbon	C04B 35/62839
Ceramic fibers coated with carbon	C04B 35/62873
Ceramics or ceramic mixtures containing carbon fibers or carbon whiskers	C04B 35/80 and subgroups and C04B 2235/5248
Ceramics or ceramic mixtures containing carbon nanotubes	C04B 35/80 and subgroups and C04B 2235/5288
Coating or impregnating a ceramic substrates with carbon	C04B 41/5001 and subgroups
Carbon additives for ceramics	C04B 2235/422 and subgroups
Organics compounds becoming part of a ceramic after heat-treatment, e.g. phenol resins	C04B 2235/48 and subgroups
Fibrous carbon additives for ceramics	C04B 2235/5248
Carbon nanotube additives for ceramics	C04B 2235/5288
Ceramics or ceramic mixtures containing carbon as an impurity	C04B 2235/721
Carbon interlayer used for joining a ceramic with another substrate	C04B 2237/086
Carbon substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/363
Carbon materials for grafts or prostheses or for coating grafts or prostheses	A61L 27/08, A61L 27/08
Carbon-based inorganic membranes	B01D 71/021
Presses for the formation of diamonds or boronitride	B01J 3/065 and subgroup
Catalysts comprising carbon	B01J 21/18, B01J 21/18, and subgroup, C07C 2521/18
High pressure synthesis of diamond	B01J 2203/0655
Rods, electrodes, materials, or media, for use in soldering, welding, or cutting: non-consumable electrodes; C-electrode	B23K 35/0205

Carbon electrodes for use in soldering, welding, or cutting	B23K 35/402
The preparation of carbon powders per se, not preparative to the making of carbon ceramics	C01B 31/00 and subgroups
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: carbon	C09C 1/44, C09C 1/44 and subgroups
Electrodes for electrolytic processes based on carbon	C25B 11/12 and subgroup
Carbon ceramics in machines or engines in general (F01) or machines for liquids (F04)	F05C 2203/0808, F05C 2203/0882
Constructions of heat-exchange apparatus characterised by the selection of particular materials, of carbon, e.g. graphite	F28F 21/02, F28F 21/02
Carbonic moderators in nuclear reactors	G21C 5/126
Non-adjustable resistors formed as one or more layers or coatings; Non-adjustable resistors made from powdered conducting material or powdered semi-conducting material with or without insulating material having negative temperature coefficient mainly consisting of Carbon or carbides	H01C 7/048
Field emission cathodes common to discharge tubes: carbon type	H01J 2201/30453 and subgroups
Field emission cathodes common to electron emission display panels: carbon type	H01J 2329/0444 and subgroups
Forming inorganic semiconducting materials on a substrate, the substrate being carbon, e.g. diamond-like carbon	H01L 21/02376, H01L 21/02376
Semiconductor bodies: diamond	H01L 29/1602, H01L 29/1602
Electrodes based on carbonaceous material, e.g. graphite-intercalation compounds or CFx for fuel cells and batteries	H01M 4/133 , H01M 4/1393, , H01M 4/583 and subgroup, H01M 4/663, H01M 4/133 , H01M 4/1393, , H01M 4/583 and subgroup, H01M 4/663
Carbon-based electrodes for fuel cells and batteries	H01M 4/96
Ohmic-resistance heating, heater elements characterised by the composition or nature of the conductive material being carbon only, e.g. carbon black, graphite	H05B 3/145, C03B 2205/63 (for fiber drawing)
Electrodes mainly consisting of carbon for heating by electric discharge	H05B 7/085 and subgroup
Carbon-based electrodes for electric arc lamps	H05B 31/08 and subgroups

Special rules of classification

The carbonaceous additives used for making the carbon-based body are further indicated with the codes C04B 2235/424 (carbon black), C04B 2235/425 (graphite) and C04B 2235/427 (diamond).

Diamond based composites are classified normally in C04B 35/52 rather than in C04B 35/528.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

C/C	Carbon fibres in a carbon matrix

C04B 35/521

{obtained by impregnation of carbon products with a carbonisable material}

Definition statement

This place covers:

The carbonisable material normally is carbonised through a heat treatment. The end-product contains mainly carbon phase.

References

Limiting references

This place does not cover:

Porous carbon is infiltrated with Si-containing polymer that is carbonised to form a product containing mainly SiC	C04B 35/571
Impregnation of a carbon product with Si in order to form SiC	C04B 35/573
Porous carbon is infiltrated with Si-and N-containing polymer that is carbonised to form a product containing mainly Si_3N_4	C04B 35/589
Impregnation of a fibrous carbon product with a carbonisable material	C04B 35/83

Informative references

Attention is drawn to the following places, which may be of interest for search:

Impregnation of carbon products with materials that lead to the formation of other phases than carbon, where one of these other phases forms the largest fraction of the end-product (thus the end product does not have carbon as largest fraction anymore)	Classification is in the class of this largest fraction, e.g. impregnation with alumina to such an extent that the end-product contains more alumina than carbon leads to the class C04B 35/117 (alumina composites) and the code C04B 2235/422 (carbon additive or secondary phase in the end-product)
The synthesis and properties of porous carbon bodies	C04B 38/00 and subgroups
Porous mortars, concrete, artificial stone or ceramic ware obtained by a chemical conversion or reaction other than those relating to the setting or hardening of cement-like material or to the formation of a sol or a gel, e.g. by carbonising or pyrolysing preformed cellular materials based on polymers, organo-metallic or organo-silicon precursors	C04B 38/0022 and subgroups

Impregnation of carbon products with materials that lead to the formation of other phases than carbon, where none of these other phases form the largest fraction of the end-product	C04B 41/00 and subgroups
Materials with friction-reduced moving parts, e.g. ceramics lubricated by impregnation with carbon	C04B 2111/00344
Gas infiltration of green bodies or pre-forms	C04B 2235/614
Liquid infiltration of green bodies or pre-forms	C04B 2235/616
Impregnated carbon catalyst carriers	B01J 21/18, B01J 21/18, and subgroup, C07C 2521/18
Impregnation of carbon electrodes	C25B 11/14

Special rules of classification

The symbols C04B 2235/614 and C04B 2235/616 are used in combination with C04B 35/521 to indicate whether the infiltration is through gas or liquid, respectively.

C04B 35/522

{Graphite (C04B 35/536 takes precedence)}

Definition statement

This place covers:

All shaped products or mixtures for making a shaped product that have graphite as the largest fraction

References

Limiting references

This place does not cover:

All shaped products or mixtures for making a shaped product that have expanded graphite as the largest fraction	C04B 35/536

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of graphite as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of graphite specially adapted to enhance their filling properties in mortars, concrete or artificial stone	C04B 14/024
Creating porosity in ceramic products by burning out graphite	C04B 38/068
Graphite as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/425
Graphite materials for grafts or prostheses	A61L 27/08
Graphite reactor vessels	B01J 2219/0272
The preparation and after-treatment of graphite powders	C01B 31/04 and subgroups
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: graphite	C09C 1/46, C09C 1/46
Sliding surface consisting mainly of graphite	F16C 33/16

C04B 35/524

obtained from polymer precursors, e.g. glass-like carbon material

Definition statement

This place covers:

Carbon containing polymers are carbonised, leading to a product that has as largest fraction a carbon phase, e.g. carbonising a shaped phenol resin

References

Limiting references

This place does not cover:

Mixtures of polymer precursors and carbon particles, where the amount of carbon particles is larger than the amount of polymer precursors	C04B 35/532
Carbon and silicon containing polymers are carbonised, leading to a product that has as largest fraction a silicon carbide phase, e.g. carbonising a shaped polysilane resin	C04B 35/571
Carbon, silicon and nitrogen containing polymers are carbonised, leading to a product that has as largest fraction a silicon nitride phase, e.g. carbonising a shaped polysilazane resin	C04B 35/589

Informative references

Attention is drawn to the following places, which may be of interest for search:

Organic compounds becoming part of a ceramic after heat treatment, e.g. carbonising phenol resins	C04B 2235/48 and subgroups

C04B 35/528

obtained from carbonaceous particles with or without other non-organic components

Definition statement

This place covers:

The shaping of carbon particles into a compact and possible further densification through heat treatment

References

Limiting references

This place does not cover:

The shaping of graphite particles into a compact	C04B 35/522, C04B 35/536 (expanded graphite)

C04B 35/532

containing a carbonisable binder

Definition statement

This place covers:

The shaping of carbon particles into a compact and possible further densification through heat treatment, whereby binders such as pitch, tar, phenolic resin, etc., all possible binders from the range C04B 35/632-C04B 35/6365 can be used, as long as the further (heat) treatment is in non-oxidising atmosphere.

References

Limiting references

This place does not cover:

Carbon shaped bodies where the binder is not added to starting powder mixture, but is impregnated or infiltrated into an already shaped carbonaceous body	C04B 35/521
Mixtures of carbon particles with carbonisable binder, where the amount of carbonisable binder is larger than the amount of carbon particles	C04B 35/524 and C04B 2235/422 (carbon particles)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Organics compounds becoming part of a ceramic after heat-treatment	C04B 2235/48 and subgroups
Preparation of active carbon using carbonaceous precursors per se and binders, e.g. pitch, and producing the granules	C01B 31/14

Special rules of classification

If a carbonisable binder is used, classification in C04B 35/528 is not necessary, unless also the possibility of not using the carbonisable binder is disclosed. C04B 35/532 is also given to graphite powders containing a carbonisable binder, together with C04B 35/522 (or C04B 35/536).

Since the class C04B 35/532 already indicates that organics are carbonised and become part of the ceramic, the code C04B 2235/48 is superfluous.

C04B 35/536

based on expanded graphite {or complexed graphite}

Definition statement

This place covers:

Shaped objects of expanded graphite, possibly further heat-treated, or preparing of expanded graphite preparatory to the shaping of the mixture

References

Limiting references

This place does not cover:

Creating porosity in the ceramic product by expanding the graphite	C04B 38/02

Informative references

Attention is drawn to the following places, which may be of interest for search:

Graphite as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/425
The preparation and after-treatment of intercalated graphite powders	C01B 31/005, C01B 31/0415
The preparation and after-treatment of expanded or exfoliated graphite powders	C01B 31/0423
Intercalated carbon- or graphite fibres	D01F 11/129
Electrodes based on carbonaceous material, e.g. graphite-intercalation compounds or CFx for fuel cells and batteries	H01M 4/133 , H01M 4/1393, , H01M 4/583 and subgroup, H01M 4/663, H01M 4/133 , H01M 4/1393, , H01M 4/583 and subgroup, H01M 4/663

C04B 35/547

based on sulfides or selenides {or tellurides}

Definition statement

This place covers:

Ceramics having as the largest fraction a sulphide, selenide or telluride phase, or a mixture of these phases

References

Limiting references

This place does not cover:

Starting powder mixtures based on sulphides, selenides or tellurides used to make ceramics	C04B 2235/446

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating ceramic substrates with salts or salty compositions: containing sulphur in the anion, e.g. sulphides	C04B 41/5014
Coating or impregnating ceramic substrates with sulphides or selenides	C04B 41/5054
Catalysts comprising sulphides	B01J 27/04 and subgroups

Sulphide compounds per se	C01B 17/20 and subgroups
Selenides and tellurides per se	C01B 19/007
Preparation of sulphides metal compounds in general	C01G 1/12
Chalcogenide glasses, e.g. containing S, Se, Te	C03C 3/321 and subgroup, C03B 2201/86, C03B 2201/88
Luminescent, e.g. electroluminescent, chemiluminescent materials containing sulphides	C09K 11/56 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing two or more rare earth metals: oxysulfides	C09K 11/7771
Single crystals based on Sulphur-, selenium- or tellurium-containing compounds	C30B 29/46 and subgroups
Sulphide ceramics in machines or engines in general (F01) or machines for liquids (F04)	F05C 2203/0856 and subgroup
Forming inorganic semiconducting materials on a substrate, the substrate being a sulphide	H01L 21/02406, H01L 21/02406
Forming inorganic semiconducting materials on a substrate, the substrate being a selenide	H01L 21/02409, H01L 21/02409
Forming inorganic semiconducting materials on a substrate, the substrate being a telluride	H01L 21/02411, H01L 21/02411
Electrodes for accumulators with non-aqueous electrolyte based on inorganic compounds other than oxides or hydroxides, e.g. sulphides, selenides, tellurides, halogenides or LiCoFy	H01M 4/136, H01M 4/1397, H01M 4/136, H01M 4/1397

C04B 35/553

based on fluorides

Definition statement

This place covers:

Ceramics having as the largest fraction a fluoride phase

References

Limiting references

This place does not cover:

Starting powder mixtures based on fluorides used to make ceramics	C04B 2235/445

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating ceramic substrates with fluorine compounds	C04B 41/5018
Coating or impregnating ceramic substrates with fluorides	C04B 41/5055
Catalysts containing fluoride	B01J 27/12

Fluorides per se	C01B 7/19 and subgroups, C01B 9/08, C01B 11/24
Fluorides of sodium, potassium or alkali metals in general	C01D 3/02
Fluoride glasses	C03C 3/325, C03B 2201/82 and subgroup

C04B 35/56

based on carbides {or oxycarbides (containing free metal binder C22C 29/00)}

Definition statement

This place covers:

Ceramics having as the largest fraction a carbide phase, a compound between carbon and a metal or semi-metal, e.g. e.g. potassium carbide, magnesium carbide, Cerium carbide (CeC_2), Manganese carbide (Mn_3C), Iron carbide (Fe_3C), Cobalt carbide (CoC), Nickel carbide (Ni_3C), Copper carbide (Cu_2C), Zinc carbide (ZnC), Germanium carbide (GeC), Gold carbide (Au_2C_2), Silver carbide (Ag_2C_2), Antimony carbide (SbC).

References

Limiting references

This place does not cover:

Carbo-nitride ceramics	C04B 35/58 and subgroups
Carbides containing a metallic binder	C22C 29/06 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: carbides	C04B 14/322 and subgroups
Making fibres based on carbides	C04B 35/62277
Coating or impregnating ceramic substrates with carbides	C04B 41/5057
Carbides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. rare earth carbide	C04B 2235/3817 and subgroups
Metal as starting material for making ceramics or as secondary phase of a sintered ceramic, not being present as a binding phase, e.g. La, Y, Mn, Re, Zn, Ga, In, Ge, Sb, Pb, Bi	C04B 2235/40 and subgroups
Carbon as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/422
Organic compounds becoming part of a ceramic after heat treatment, e.g. carbonising phenol resins	C04B 2235/48 and subgroups
Carbide interlayer used for joining a ceramic with another substrate	C04B 2237/083

Materials for prostheses based on metal carbides	A61F 2310/00269 and subgroups
Coating materials for prostheses based on metal carbides	A61F 2310/0073 and subgroups
Carbide catalysts	B01J 27/22, B01J 27/22, C07C 2527/22 and subgroups
Casting non-ferrous metals with a high melting point, e.g. metallic carbides	B22D 21/06
Rods, electrodes, materials, or media, for use in soldering, welding, or cutting comprising refractory compounds, e.g. carbides	B23K 35/327, B23K 35/327
Making carbide powders	C01B 31/30 and subgroups
Materials for coating a single layer on glass: carbides, silicides	C03C 2217/282
Making hard metals based on borides, carbides, nitrides, oxides or silicides; Preparation of the powder mixture used as the starting material	C22C 1/051
Making hard metals based on borides, carbides, nitrides, oxides, silicides starting from a melt	C22C 1/1068
Metallic alloys based carbides, but not containing other metal compounds	C22C 29/06 and subgroups
Coating by vacuum evaporation, by sputtering or by ion implantation of the coating forming material: carbides	C23C 14/0635
Chemical coating by decomposition of gaseous compounds, without leaving reaction products of surface material in the coating, i.e. chemical vapour deposition (CVD) processes: carbides	C23C 16/32 and subgroup
Single crystals of carbides	C30B 29/36
Carbide ceramics in machines or engines in general (F01) or machines for liquids (F04)	F05C 2203/0813 and subgroups
Friction linings	F16D 69/02
Non-adjustable resistors formed as one or more layers or coatings; Non-adjustable resistors made from powdered conducting material or powdered semi-conducting material with or without insulating material having negative temperature coefficient mainly consisting of carbon or carbides	H01C 7/048, H01C 7/048
Varistor cores, Carbide, e.g. SiC type	H01C 7/118, H01C 7/118
Electrical contacts having a noble metal as the basic material and containing carbides	H01H 1/0233, H01H 1/0233
Encapsulations with oxides or nitrides or carbides, e.g. ceramics, glass, e.g. encapsulating layers, coatings of semi-conductors	H01L 23/291, H01L 23/291
Heater elements characterised by the composition or nature of the materials or by the arrangement of the conductor: conductive ceramics, e.g. metal oxides, metal carbides, barium titanate, ferrites, zirconia, vitreous compounds	H05B 3/141 and subgroup

Special rules of classification

Carbonitrides are seen as nitrides. If a ceramic is however a mixture of separate carbide and nitride phases, then classification occurs in the class that corresponds to the phase that is present as the largest fraction, which could be a carbide class.

C04B 35/5603

{with a well-defined oxygen content, e.g. oxycarbides}

Definition statement

This place covers:

All oxy-carbides and all carbides that contain oxygen in the principal carbide phase

References

Limiting references

This place does not cover:

Carbide ceramics containing oxide secondary phases, e.g. a carbide containing a silica sintering aid	C04B 35/56 or subgroups, except C04B 35/5603 and symbols from C04B 2235/32-C04B 2235/365 to indicate the oxide phase

Informative references

Attention is drawn to the following places, which may be of interest for search:

Non-oxides with a defined oxygen content as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. SiOC, SiON, TiON	C04B 2235/3895
Making powders of oxycarbides, sulfocarbides or mixtures of carbides with other bodies, e.g. graphite; Carbides of other non-metals, e.g. silicocarbides, borocarbides	C01B 31/301
Silicon oxycarbide, oxynitride or oxycarbonitride glasses	C03C 3/045
Manufacture or treatment of semiconductor devices or of parts thereof: forming insulating materials on a substrate: the material containing Si, O, and at least one of H, N, C, F, or other non-metal elements, e.g. SiOC, SiOC:H or SiONC	H01L 21/02126
Manufacture or treatment of semiconductor devices or of parts thereof, forming insulating materials on a substrate by gas or vapour deposition, the material containing carbon doped silicon oxide, e.g. SiOC	H01L 21/31633, H01L 21/31633

Special rules of classification

The oxy-carbides are also classified in the other sub-groups of C04B 35/56, e.g. titanium oxy-carbide is classified in C04B 35/5603 and C04B 35/5611. Silicon oxy-carbide is classified in C04B 35/5603 and in C04B 35/565 or one of the subgroups of C04B 35/565. Carbides that are normally classified in the head group C04B 35/56 are only classified in C04B 35/5603, in the case it is an oxy-carbide and not in C04B 35/56.

C04B 35/5607

{based on refractory metal carbides}

Definition statement

This place covers:

Ceramics based on refractory metal carbides or refractory metal oxy-carbides

References

Limiting references

This place does not cover:

Refractory carbides other than refractory metal carbides, e.g. a SiC refractory or boron carbide refractory	C04B 35/565 respectively C04B 35/563
Cemented refractory carbides	C22C 29/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Oxide ceramics based on vanadium, niobium, tantalum, molybdenum or tungsten oxides or solid solutions thereof with other oxides, e.g. vanadates, niobates, tantalates, molybdates or tungstates	C04B 35/495 and subgroups
Refractory metal nitride ceramics	C04B 35/58007 and subgroups
Refractory metal boride ceramics	C04B 35/58064 and subgroups/
Refractory metal silicide ceramics	C04B 35/58092 and subgroups/
Refractory mortars or monolithic refractories	C04B 35/66
Refractory metal carbides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. VC, Cr_3C_2, ZrC, HfC, NbC, TaC, MoC or Mo_2C	C04B 2235/3839 and subgroups
Refractory metals as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. titanium (Ti), chromium (Cr), tantalum (Ta)	C04B 2235/404
Coating for prosthesis made of tantalum carbide	A61F 2310/00269
Coating for prosthesis made of chromium carbide	A61F 2310/00754
Coating for prosthesis made of niobium carbide	A61F 2310/00772
The preparation of tungsten or molybdenum carbide powders	C01B 31/34

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Refractory carbides	titanium carbide, vanadium carbide, chromium carbide, zirconium carbide, niobium carbide, molybdenum carbide, hafnium carbide, tantalum carbide, tungsten carbide

C04B 35/5611

{based on titanium carbides}

Definition statement

This place covers:

Ceramics based on titanium carbides or titanium oxy-carbides

References

Limiting references

This place does not cover:

Titanium (oxy)carbonitride ceramics	C04B 35/58021
Titanium (oxy)carbide with a metallic binder	C22C 29/10

Informative references

Attention is drawn to the following places, which may be of interest for search:

Titanium oxide based ceramics	C04B 35/46 and subgroups
Titanium (oxy)nitride ceramics	C04B 35/58014 and subgroup
Titanium (oxy)boride ceramics	C04B 35/58071
After-treatment of mortars, concrete, artificial stone or ceramics; Treatment of natural stone: with titanium carbide	C04B 41/5061
Titanium carbide as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. TiC	C04B 2235/3843
Materials for prostheses, containing titanium carbide	A61F 2310/00748
Making titanium (oxy)carbide powders	C01B 31/305
Titanium carbide ceramics in machines or engines in general (F01) or machines for liquids (F04)	F05C 2203/0821
Materials for prostheses, coatings containing titanium carbide	**K6F2/00B22B4T**

Special rules of classification

In the case of mixed refractory carbides, e.g. TiCrC, both C04B 35/5607 (for the Cr) and C04B 35/5611 are added, since the amount of Ti and Cr is the same. $Ti_{0.9}Cr_{1.1}C$ is only classified in C04B 35/5607 (possibly using an additional symbol (CCA) to indicate the presence of Ti, e.g. C04B 2235/3843 or C04B 2235/404)

C04B 35/5615

{based on titanium silicon carbides}

Definition statement

This place covers:

Ceramics based on titanium carbides or titanium oxy-carbides that also contain silicon, or silicon carbides or silicon oxy-carbides that also contain titanium

References

Limiting references

This place does not cover:

Silicon carbide based ceramics	C04B 35/565 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating ceramic substrates with titanium carbide	C04B 41/5061
Silicon carbides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. SiC or SiOC	C04B 2235/3826 and subgroups
Silicon as starting material for making a ceramic or as secondary phase of a sintered ceramic	C04B 2235/428

Special rules of classification

The relation between Ti and Si can vary to almost any extent, thus both $Ti_{0.9}Si_{0.1}C$ and $Ti_{0.1}Si_{0.9}C$ are classified in this group and neither in C04B 35/5611 nor in C04B 35/565 and subgroups. Only when the amount of Ti or Si is very low, classification in C04B 35/5611 or in C04B 35/565 and subgroups might be considered.

C04B 35/5618

{based on titanium aluminium carbides}

Definition statement

This place covers:

Ceramics based on titanium carbides or titanium oxy-carbides that also contain aluminium, or aluminium carbides or aluminium oxy-carbides that also contain titanium

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Aluminium carbide based ceramics	C04B 35/56
Carbides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. aluminum carbide	C04B 2235/3817
Aluminium as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/402

Special rules of classification

The relation between Ti and Al can vary to almost any extent, thus both $Ti_{0.9}Al_{0.1}C$ and $Ti_{0.1}Al_{0.9}C$ are classified in this group and neither in C04B 35/5611 nor in C04B 35/56. Only when the amount of Ti or Al is very low, classification in C04B 35/5611 or in C04B 35/56 might be considered.

C04B 35/5622

{based on zirconium or hafnium carbides}

Definition statement

This place covers:

Ceramics based on zirconium or hafnium carbides or zirconium or hafnium oxy-carbides

References

Limiting references

This place does not cover:

Zirconium or hafnium (oxy)carbonitride ceramics	C04B 35/58028

Informative references

Attention is drawn to the following places, which may be of interest for search:

Zirconium oxide based ceramics	C04B 35/48 and subgroups
Zirconium or hafnium (oxy)nitride ceramics	C04B 35/58028
Zirconium or hafnium (oxy)boride ceramics	C04B 35/58078
Materials for prostheses, coatings made of zirconium carbide	A61F 2310/00766
Materials for prostheses, coatings made of hafnium carbide	A61F 2310/00778

Special rules of classification

In the case of mixed refractory carbides, e.g. ZrTiC, both C04B 35/5611 (for the Ti) and C04B 35/5622 are added, since the amount of Ti and Zr is the same. $Ti_{0.9}Zr_{1.1}C$ is only classified in C04B 35/5622 (possibly using an additional symbol(CCA) to indicate the presence of Ti, e.g. C04B 2235/3843 or C04B 2235/404)

C04B 35/5626

{based on tungsten carbides}

Definition statement

This place covers:

Ceramics based on tungsten carbides or tungsten oxy-carbides

References

Limiting references

This place does not cover:

Tungsten (oxy)carbonitride ceramics	C04B 35/58007
Tungsten carbide with a metallic binder	C22C 29/10

Informative references

Attention is drawn to the following places, which may be of interest for search:

Tungsten oxide based ceramics	C04B 35/495 and subgroups
Tungsten (oxy)nitride ceramics	C04B 35/58007
Tungsten (oxy)boride ceramics	C04B 35/58064
Tungsten carbides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. WC	C04B 2235/3847
Coating for prosthesis made of tungsten carbide	A61F 2310/0079 , A61F 2310/0079
The preparation of tungsten or molybdenum carbide powders	C01B 31/34
Metallic alloys based on tungsten carbide	C22C 29/10
Tungsten carbide ceramics in machines or engines in general (F01) or machines for liquids (F04)	F05C 2203/0826

Special rules of classification

In the case of mixed carbides, e.g. WSiC, both C04B 35/565 (for the Si) and C04B 35/5626 are added, since the amount of W and Si is the same. $Si_{0.9}W_{1.1}C$ is only classified in C04B 35/5626 (possibly using an additional symbol (CCA) to indicate the presence of Si, e.g. C04B 2235/3826 or C04B 2235/428)

C04B 35/563

based on boron carbide

Definition statement

This place covers:

Ceramics based on boron carbides or boron oxy-carbides

References

Limiting references

This place does not cover:

Ceramics based on boron carbo-nitride	C04B 35/583 and subgroup
Boron carbide with a metallic binder	C22C 29/062

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: boron carbide	C04B 14/323
Ceramics based on boron oxide	C04B 35/01 together with C04B 2235/3409

Ceramics based on boron oxycarbide	C04B 35/5603 and C04B 35/563
Coating or impregnating ceramic substrates with boron carbide	C04B 41/5058
Boron oxide or borate as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3409
Boron carbide as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. B_4C	C04B 2235/3821
Boron as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/421
Boron-containing organic compounds becoming part of a ceramic after heat treatment, e.g. borazine, borane or boranyl	C04B 2235/486
Materials for prostheses based on boron carbide	A61F 2310/00275
Coatings for prostheses based on boron carbide	A61F 2310/00736
The preparation of boron or silicon carbide powders	C01B 31/36
Metallic alloys based on B_4C	C22C 29/062

Special rules of classification

In the case of mixed carbides, e.g. SiBC, both C04B 35/565 (for the Si) and C04B 35/563 are added, since the amount of B and Si is the same. $Si_{0.9}B_{1.1}C$ is only classified in C04B 35/563 (possibly using an additional symbol (CCA) to indicate the presence of Si, e.g. C04B 2235/3826 or C04B 2235/428). $B_{0.9}Si_{1.1}C$ is only classified in C04B 35/565 or subgroup of C04B 35/565 (possibly using an additional symbol (CCA) to indicate the presence of B, e.g. C04B 2235/3821 or C04B 2235/421).

C04B 35/565

based on silicon carbide

Definition statement

This place covers:

Ceramics based on silicon carbides or silicon oxy-carbides

References

Limiting references

This place does not cover:

Silicon carbide based ceramics containing also Ti, e.g. $Ti_{0.1}Si_{0.9}C$	C04B 35/5615
Ceramics based on silicon carbo-nitride	C04B 35/584 and subgroups
Silicon carbide with a metallic binder	C22C 29/065

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: silicon carbide	C04B 14/324

Ceramics based on silicon oxide	C04B 35/14
Ceramics based on silicon oxycarbide	C04B 35/5603 and C04B 35/565 and subgroups
Ceramics based on silicon nitride	C04B 35/584 and subgroups
Making fibres based on silicon carbide	C04B 35/62281
Coating or impregnating ceramic substrates with silicon carbide	C04B 41/5059
Silicon carbides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. SiC or SiOC	C04B 2235/3826 and subgroups
Si-containing organic compounds becoming part of a ceramic after heat treatment, e.g. silicone resins, (poly)silanes, (poly)siloxanes or (poly)silazanes	C04B 2235/483
Cubic symmetry, e.g. beta SiC	C04B 2235/762
Hexagonal symmetry, alpha SiC	C04B 2235/767
Silicon carbide substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/365
Materials for prostheses based on silicon carbide SiC	A61F 2310/00281
Coating materials for prostheses, the coating material based on silicon carbide SiC	A61F 2310/00742
Silicon carbide catalyst	B01J 27/224, B01J 27/224 and subgroup, C07C 2527/224
The preparation of boron or silicon carbide powders	C01B 31/36
Metallic alloys based on SiC	C22C 29/065
Chemical coating by decomposition of gaseous compounds, without leaving reaction products of surface material in the coating, i.e. chemical vapour deposition (CVD) processes: silicon carbide	C23C 16/325
Rope or cable materials: silicon carbides	D07B 2205/3017
Silicon carbide ceramics in machines or engines in general (F01) or machines for liquids (F04)	F05C 2203/0817
Varistor cores, Carbide, e.g. SiC type	H01C 7/118, H01C 7/118
Forming inorganic semiconducting materials on a substrate, the coating being silicon carbide	H01L 21/02167, H01L 21/02447, H01L 21/02529, H01L 21/3148, H01L 21/02167, H01L 21/02447, H01L 21/02529, H01L 21/3148

Forming inorganic semiconducting materials on a substrate, the substrate being silicon carbide	H01L 21/02378, H01L 21/0445 and subgroups, H01L 21/8213, H01L 29/1608, H01L 29/1608 , H01L 21/02378, H01L 21/0445 and subgroups, H01L 21/8213, H01L 29/1608
Thin film transistors having a semiconductor body comprising semiconductor materials of the fourth group not being silicon, or alloys including an element of the group IV, e.g. Ge, SiN alloys, SiC alloys	H01L 29/78684 and subgroup, H01L 29/78684 and subgroup
Semiconductor devices sensitive to infra-red radiation, light, electromagnetic radiation of shorter wavelength or corpuscular radiation and adapted either for the conversion of the energy of such radiation into electrical energy or for the control of electrical energy by such radiation; Processes or apparatus peculiar to the manufacture or treatment thereof or of parts thereof; details thereof: characterised by their semiconductor bodies: including, apart from doping materials or other impurities, only AIVBIV compounds, e.g. SiC	H01L 31/0312 and subgroups, H01L 31/03687, H01L 31/03765, H01L 31/1816, H01L 31/204, H01L 31/0312 and subgroups, H01L 31/03687, H01L 31/03765, H01L 31/1816, H01L 31/204
Heater elements characterised by the composition or nature of the materials or by the arrangement of the conductor: silicon, e.g. silicon carbide, magnesium silicide, heating transistors or diodes	H05B 3/148

Special rules of classification

Both $Ti_{0.9}Si_{0.1}C$ and $Ti_{0.1}Si_{0.9}C$ are classified in C04B 35/5615 and not in C04B 35/5611 nor in C04B 35/565 and subgroups. Only when the amount of Ti or Si is very low, classification in C04B 35/5611 or in C04B 35/565 and subgroups might be considered.

In the case of mixed carbides, e.g. SiBC, both C04B 35/565 (for the Si) and C04B 35/563 are added, since the amount of B and Si is the same. $Si_{0.9}B_{1.1}C$ is only classified in C04B 35/563 (possibly using an additional symbol (CCA) to indicate the presence of Si, e.g. C04B 2235/3826 or C04B 2235/428). $B_{0.9}Si_{1.1}C$ is only classified in C04B 35/565 or subgroup of C04B 35/565 (possibly using an additional symbol (CCA) to indicate the presence of B, e.g. C04B 2235/3821 or C04B 2235/421).

For all other mixed carbides containing Si the reasoning is as with SiBC, classification is in the carbide group of the metal element that is most abundant, with the exception of TiSi-carbides.

If the main phase is alpha SiC, C04B 2235/767 (hexagonal phase) is attributed, if the main phase is beta SiC, C04B 2235/762 (cubic phase) is attributed.

Synonyms and Keywords

SiC/SiC	Silicon carbide reinforced with silicon carbide fibers

C04B 35/571

obtained from {Si-containing} polymer precursors {or organosilicon monomers}

Definition statement

This place covers:

Silicon carbide ceramics made by pyrolysing silicone resins, (poly)silanes, (poly)siloxanes, (poly)silazanes etc., or porous ceramics that are infiltrated with a silicon-containing resin and pyrolysed to a product that contains mainly silicon carbide

References

Limiting references

This place does not cover:

Porous carbon is infiltrated with Si-containing polymer that is carbonised to form a product containing mainly carbon	C04B 35/521
Carbon and silicon containing polymers are carbonised, leading to a product that has as largest fraction a carbon phase	C04B 35/524

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on carbon obtained from polymer or organic precursors	C04B 35/524
Ceramics based on silicon nitride obtained from polymer or organic precursors	C04B 35/591
Si-containing organic compounds, e.g. silicone resins, (poly)silanes, (poly)siloxanes or (poly)silazanes used for becoming part of a ceramic after heat-treatment, e.g. phenol resins	C04B 2235/483

Special rules of classification

The end-product of the pyrolysis needs to have as largest fraction a silicon carbide phase. If after pyrolysis the product is hot-pressed, C04B 35/575 is added as well.

C04B 35/573

obtained by reaction sintering {or recrystallisation}

Definition statement

This place covers:

A carbon containing material and a silicon containing material are reacted to form in-situ a SiC containing ceramics, e.g. a porous carbon body is infiltrated with molten Si and reacted to SiC or a porous carbon body is infiltrated with gaseous SiO_x and reacted to SiC, or carbon powder and SiO_2 and/or Si powder are mixed, shaped and heated to a temperature and in an atmosphere where they react to SiC

References

Limiting references

This place does not cover:

Infiltration of porous carbon product with molten Si, with the end-product containing more carbon phase than SiC	C04B 35/52
Infiltration of porous carbon product with molten Si, with the end-product containing more unreacted silicon phase than SiC	C04B 41/4584

Informative references

Attention is drawn to the following places, which may be of interest for search:

Reaction sintering to make silicon nitride based ceramics	C04B 35/591
Reaction sintering to make ceramics in general	C04B 35/65 and subgroups
A paper sheet which after carbonisation will react with silicon to form a porous silicon carbide porous body]	C04B 38/0032
Carbon as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/422 and subgroups
Silicon as starting material for making a ceramic or as secondary phase of a sintered ceramic	C04B 2235/428

Special rules of classification

The end-product of the reaction sintering needs to have as largest fraction a silicon carbide phase. If after reaction sintering the product is hot-pressed, C04B 35/575 is added as well. Silicon is not regarded as a metallic phase, thus silicon carbide materials that contain a large amount of silicon phase are not regarded as ceramics having a metallic binder, which are classified in C22C 29/00 and subgroups, but as a ceramic with a secondary phase.

If a SiC ceramic is made by mixing 55 wt% SiC with 45 wt% of Si/C mixture, and this mixture is reaction sintered, C04B 35/573 should not be given, but C04B 35/565, since the majority of the material does not result from reaction sintering.

When classifying in C04B 35/573, classification in C04B 35/65 is superfluous.

C04B 35/575

obtained by pressure sintering

Definition statement

This place covers:

A SiC-containing or forming material is densified under mechanical pressure, leading to a product having SiC as the largest fraction.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pressure sintering to make silicon nitride based ceramics	C04B 35/593
Pressure sintering to make ceramics in general	C04B 35/645

Special rules of classification

When classifying in C04B 35/575, classification in C04B 35/645 is superfluous. C04B 35/575 can be used in combination with C04B 35/571 or C04B 35/573, when pressure sintering a silicon containing polymer respectively when pressure sintering a reaction sintered SiC based ceramic.

C04B 35/5755

{obtained by gas pressure sintering}

Definition statement

This place covers:

A SiC-containing or forming material is densified under gas pressure, leading to a product having SiC as the largest fraction.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Gas pressure sintering to make silicon nitride based ceramics	C04B 35/5935
Hot isostatic pressing to make ceramics in general	C04B 35/6455

Special rules of classification

When classifying in C04B 35/5755, classification in C04B 35/6455 is superfluous. C04B 35/5755 can be used in combination with C04B 35/571 or C04B 35/573, when gas pressure sintering a silicon containing polymer respectively when gas pressure sintering a reaction sintered SiC based ceramic.

C04B 35/58

based on borides, nitrides, {i.e. nitrides, oxynitrides, carbonitrides or oxycarbonitrides} or silicides {(containing free binder metal C22C 29/00)}

Definition statement

This place covers:

Making nitride ceramics, compounds between nitrogen and a metal or semi-metal, e.g. aluminum nitride, alkali nitrides, alkaline earth metal nitrides, rare earth nitrides, gallium nitride, indium nitride, carbonitrides, oxynitrides

References

Limiting references

This place does not cover:

The preparation of nitride powders per se, not preparative to the making of nitride ceramics	C01B 21/06, C01B 21/06 and subgroups, C01B 21/082 and subgroups
Carbonitrides containing a metallic binder	C22C 29/04
Nitrides containing a metallic binder	C22C 29/16

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: granular materials, e.g. micro-balloons: carbides; nitrides; borides; silicides	C04B 14/32 and subgroups
Making fibres based on nitrides	C04B 35/62286
Coating or impregnating ceramic substrates with borides, nitrides or silicides	C04B 41/5062
Nitrides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. oxynitrides, carbonitrides, oxycarbonitrides, lithium nitride (Li_3N), magnesium nitride (Mg_3N_2), rare earth nitride	C04B 2235/3852 and subgroups
Metal as starting material for making ceramics or as secondary phase of a sintered ceramic, not being present as a binding phase, e.g. La, Y, Mn, Re, Zn, Ga, In, Ge, Sb, Pb, Bi	C04B 2235/40 and subgroups
Gases other than oxygen used as reactant for making a ceramic phase, e.g. nitrogen used to make a nitride phase	C04B 2235/46 and subgroup
Materials for prostheses based on metal nitrides	A61F 2310/00299 and subgroups
Coating or prosthesis-covering structure made of compounds based on metal nitrides	A61F 2310/00856 and subgroups
High pressure synthesis of gallium nitrides	B01J 2203/0665
The preparation of oxynitride powders per se, not preparative to the making of nitride ceramics	C01B 21/0821
The preparation of aluminium oxynitride powders per se, not preparative to the making of nitride ceramics	C01B 21/0825
The preparation of carbonitrides or oxycarbonitrides of metals, boron or silicon per se, not preparative to the making of nitride ceramics	C01B 21/0828
Silicon oxycarbide, oxynitride or oxycarbonitride glasses	C03C 3/045
Nitride glasses	C03C 3/328
Nitride coating on glass	C03C 17/225, C03C 17/3435, C03C 17/3626
Nitride coatings on glass	C03C 2217/281 , C03C 2217/281
Luminescent, e.g. electroluminescent, chemiluminescent materials containing nitrides	C09K 11/0883, C09K 11/7492
Making hard metals based on borides, carbides, nitrides, oxides or silicides; Preparation of the powder mixture used as the starting material	C22C 1/051
Making hard metals based on borides, carbides, nitrides, oxides, silicides starting from a melt	C22C 1/1068
Alloys based on carbonitrides	C22C 29/04
Single crystals of nitrides	C30B 29/38, C30B 29/403 and subgroup

Nitride ceramics in machines or engines in general (F01) or machines for liquids (F04)	F05C 2203/083 and subgroups
Forming inorganic semiconducting materials on a substrate, the substrate being a nitride	H01L 21/02389, H01L 21/02389
Forming inorganic semiconducting materials on a substrate, the substrate containing a nitride coating layer	H01L 21/02458, H01L 21/02458, H01L 21/0254, H01L 21/0254
Making conductor-insulator-semiconductor electrode the insulator being formed after the semiconductor body, the semiconductor being silicon: making the insulator on single crystalline silicon, e.g. using a liquid, i.e. chemical oxidation in a nitrogen-containing ambient, e.g. nitride deposition, growth, oxynitridation, NH_3 nitridation, N_2O oxidation, thermal nitridation, RTN, plasma nitridation, RPN	H01L 21/28202, H01L 21/28202
Treatment of semiconductor bodies to form insulating layers thereon, e.g. for masking or by using photolithographic techniques composed of alternated layers or of mixtures of nitrides and oxides or of oxynitrides, e.g. formation of oxynitride by oxidation of nitride layers	H01L 21/3143 and subgroups
Treatment of semiconductor bodies to form insulating layers thereon, e.g. for masking or by using photolithographic techniques composed of nitrides	H01L 21/318, H01L 21/318
Encapsulations with oxides or nitrides or carbides, e.g. ceramics, glass, e.g. encapsulating layers, coatings of semi-conductors	H01L 23/291, H01L 23/291
Semiconductor bodies including, apart from doping materials or other impurities, only AIIIBV compounds: nitride compounds	H01L 29/2003, H01L 29/2003
Metal-insulator-semiconductor electrodes the insulating material containing nitrogen, e.g. nitride, oxynitride, nitrogen-doped material	H01L 29/518, H01L 29/518
Semiconductor devices with at least one potential-jump barrier or surface barrier specially adapted for light emission; Processes or apparatus specially adapted for the manufacture or treatment thereof or of parts thereof; Details thereof, Processes for devices with an active region comprising only III-V compounds comprising nitride compounds	H01L 33/007, H01L 33/007
Semiconductor devices with at least one potential-jump barrier or surface barrier specially adapted for light emission; Processes or apparatus specially adapted for the manufacture or treatment thereof or of parts thereof; Details thereof, Processes for devices with an active region comprising only III-V compounds with a substrate not being a III-V compound comprising nitride compounds	H01L 33/0075, H01L 33/0075
Processes or apparatus peculiar to the manufacture or treatment of superconducting devices comprising nitrides or carbonitrides	H01L 39/2416, H01L 39/2416
Heater elements characterised by the composition or nature of the materials or by the arrangement of the conductor: silicon, e.g. silicon carbide, magnesium silicide, heating transistors or diodes	H05B 3/148, H05B 3/148

Special rules of classification

Carbonitrides are seen as nitrides. If a ceramic is however a mixture of separate carbide and nitride phases, then classification occurs in the class that corresponds to the phase that is present as the largest fraction, which could be a carbide class.

C04B 35/58007

{based on refractory metal nitrides}

Definition statement

This place covers:

Ceramics based on refractory metal nitrides or refractory metal oxy-nitrides

References

Limiting references

This place does not cover:

Refractory nitrides other than refractory metal nitrides, e.g. a silicon nitride refractory or boron nitride refractory	C04B 35/584 respectively C04B 35/583
Cemented refractory nitrides	C22C 29/16

Informative references

Attention is drawn to the following places, which may be of interest for search:

Oxide ceramics based on vanadium, niobium, tantalum, molybdenum or tungsten oxides or solid solutions thereof with other oxides, e.g. vanadates, niobates, tantalates, molybdates or tungstates	C04B 35/495 and subgroups
Refractory metal carbide ceramics	C04B 35/5607 and sub/classes
Refractory metal boride ceramics	C04B 35/58064 and sub/classes
Refractory metal silicide ceramics	C04B 35/58092 and sub/classes
Refractory mortars or monolithic refractories	C04B 35/66
Refractory metal nitrides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. vanadium nitride (VN), tungsten nitride (WN_2)	C04B 2235/3886
Refractory metals as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. titanium (Ti), chromium (Cr), tantalum (Ta)	C04B 2235/404
Coating or prosthesis-covering structure made of chromium nitride	A61F 2310/00754
Coating or prosthesis-covering structure made of niobium nitride	A61F 2310/00754
Coating or prosthesis-covering structure made of tantalum nitride	A61F 2310/0091
The preparation of nitride powders per se, not preparative to the making of nitride ceramics, with vanadium, niobium or tantalum	C01B 21/0617, C01B 21/0617
The preparation of nitride powders per se, not preparative to the making of nitride ceramics, with chromium, molybdenum or tungsten	C01B 21/062, C01B 21/062

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Refractory nitrides	titanium nitride, vanadium nitride, chromium nitride, zirconium nitride, niobium nitride, molybdenum nitride, hafnium nitride, tantalum nitride, tungsten nitride

C04B 35/58014

{based on titanium nitrides, e.g. TiAlON}

Definition statement

This place covers:

Ceramics based on titanium nitrides or titanium oxy-nitrides

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Titanium oxide based ceramics	C04B 35/46 and subgroups
Titanium (oxy)carbide based ceramics	C04B 35/5611 and subgroups
Titanium (oxy)boride based ceramics	C04B 35/58071
Coating or impregnating ceramic substrates with titanium nitride	C04B 41/5068
Materials for prostheses based on titanium nitrides	A61F 2310/00323
Coating or prosthesis-covering structure made of titanium nitride	A61F 2310/0088
The preparation of titanium, zirconium or hafnium nitride powders per se, not preparative to the making of nitride ceramics	C01B 21/076 and subgroups, C01B 21/076
Titanium nitride ceramics in machines or engines in general (F01) or machines for liquids (F04)	F05C 2203/0847
Making conductor-insulator-semiconductor electrodes the insulator being formed after the semiconductor body, the semiconductor being silicon the final conductor layer next to the insulator being a composite, e.g. TiN	H01L 21/28088, H01L 21/28088
Metal-insulator-semiconductor electrodes the conductor material next to the insulator being a composite material, e.g. organic material, TiN, $MoSi_2$	H01L 29/4966, H01L 29/4966

Special rules of classification

In the case of mixed refractory nitrides, e.g. TiCrN, both C04B 35/58007 (for the Cr) and C04B 35/58014 are added, since the amount of Ti and Cr is the same. $Ti_{0.9}Cr_{1.1}N$ is only classified in C04B 35/5607.

C04B 35/58021

{based on titanium carbonitrides}

Definition statement

This place covers:

Ceramics based on titanium carbonitrides or titanium oxycarbonitrides

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Carbonitrides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. titanium carbonitride, zirconium carbonitride	C04B 2235/3856

C04B 35/58028

{based on zirconium or hafnium nitrides}

Definition statement

This place covers:

Ceramics based on zirconium or hafnium nitrides or zirconium or hafnium oxy-nitrides

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Zirconium oxide based ceramics	C04B 35/48 and subgroups
Zirconium or hafnium (oxy)carbide ceramics	C04B 35/5622
Zirconium or hafnium (oxy)boride ceramics	C04B 35/58078
Coating or prosthesis-covering structure made of hafnium nitride	A61F 2310/00892
Coating or prosthesis-covering structure made of zirconium nitride	A61F 2310/00892
The preparation of titanium, zirconium or hafnium nitride powders per se, not preparative to the making of nitride ceramics	C01B 21/076 and subgroups, C01B 21/076
Zirconium nitride ceramics in machines or engines in general (F01) or machines for liquids (F04)	F05C 2203/0852

Special rules of classification

In the case of mixed refractory nitrides, e.g. ZrTiN, both C04B 35/58014 (for the Ti) and C04B 35/58028 are added, since the amount of Ti and Zr is the same. $Ti_{0.9}Zr_{1.1}N$ is only classified in C04B 35/58028.

C04B 35/58035

{based on zirconium or hafnium carbonitrides}

Definition statement

This place covers:

Ceramics based on zirconium or hafnium carbonitrides or zirconium or hafnium oxycarbonitrides

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Carbonitrides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. titanium carbonitride, zirconium carbonitride	C04B 2235/3856

C04B 35/58042

{based on iron group metals nitrides}

Definition statement

This place covers:

Nitride ceramics based on iron nitride, nickel nitride or cobalt nitride

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cobalt oxide based ceramics	C04B 35/01 together with C04B 2235/3275 or C04B 2235/3277
Nickel oxide based ceramics	C04B 35/01 together with C04B 2235/3279
Iron oxide based ceramics	C04B 35/26 and subgroups
Iron group carbide based ceramics	C04B 35/56
Iron group boride based ceramics	C04B 35/5805
Nitrides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. oxynitrides, carbonitrides, oxycarbonitrides, lithium nitride (Li_3N), magnesium nitride (Mg_3N_2), rare earth nitride, iron group metal nitrides	C04B 2235/3852
Iron group metals as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. nickel (Ni) or cobalt (Co)	C04B 2235/405
The preparation of nitride powders per se, not preparative to the making of nitride ceramics, with iron, cobalt or nickel	C01B 21/0622, C01B 21/0622

C04B 35/5805

{based on borides}

Definition statement

This place covers:

Ceramic materials based one or more boride phases, a compound between boron and a metal or semi-metal, e.g. e.g. aluminium boride, Rare earth boride, e.g. dysprosium boride (DyB_2), Lanthanum boride (LaB_6), Manganese boride (Mn_2B, MnB or MnB_2), Iron boride (Fe_2B, FeB), Cobalt boride (CoB), Nickel boride (NiB), Copper boride (Cu_3B_2), Gallium boride (GaB_{12}), Scandium Iridium Boride ($Sc_3Ir_5B_2$), Silver boride (AgB_2), Nickel bismuth boride ($Ni_{23-x}Bi_xB_6$), Silicon boride (SiBn)

References

Limiting references

This place does not cover:

Ceramics based on boron carbide	C04B 35/563
Ceramics based on boron nitride	C04B 35/583 and subgroup
Borides containing a metallic binder	C22C 29/14

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating ceramic substrates with borides	C04B 41/507
Boron oxide or borate as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3409
Borides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. rare earth boride	C04B 2235/3804 and subgroups
Metal as starting material for making ceramics or as secondary phase of a sintered ceramic, not being present as a binding phase, e.g. La, Y, Mn, Re, Zn, Ga, In, Ge, Sb, Pb, Bi	C04B 2235/40 and subgroups
Boron as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/421
Boron-containing organic compounds becoming part of a ceramic after heat treatment, e.g. borazine, borane or boranyl	C04B 2235/486
Materials for prostheses based on metal borides	A61F 2310/00263
Coating or prosthesis-covering structure made of compounds based on metal borides	A61F 2310/0067 and subgroups
Preparation of metal boride powders	C01B 35/04
Boride or phosphide coating on glass	C03C 17/3488
Boride or phosphide coating on glass	C03C 2217/283
Making hard metals based on borides, carbides, nitrides, oxides or silicides; Preparation of the powder mixture used as the starting material	C22C 1/051
Making hard metals based on borides, carbides, nitrides, oxides, silicides starting from a melt	C22C 1/1068
Alloys based on borides	C22C 29/14

Details of electrodes, of magnetic control means, of screens, or of the mounting or spacing thereof, common to two or more basic types of discharge tubes or lamps: main electrodes: solid thermionic cathodes with compounds having metallic conductive properties, e.g. lanthanum boride, as an emissive material	H01J 1/148, H01J 1/148

C04B 35/58057

{based on magnesium boride, e.g. MgB_2}

Definition statement

This place covers:

Ceramics based on a magnesium boride phase, whether superconducting or not

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Magnesium oxide based ceramics	C04B 35/04 and subgroups
Magnesium carbide based ceramics	C04B 35/56
Magnesium nitride based ceramics	C04B 35/58
Alkaline earth metals as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Mg	C04B 2235/401
Permanent superconductor devices comprising metal borides, e.g. MgB_2	H01L 39/141, H01L 39/141
Superconducting devices comprising a junction of dissimilar materials, namely Josephson-effect devices comprising metal borides, e.g. MgB_2	H01L 39/226, H01L 39/226
Processes or apparatus peculiar to the manufacture or treatment of superconducting devices comprising metal borides, e.g. MgB_2	H01L 39/2487, H01L 39/2487

C04B 35/58064

{based on refractory borides}

Definition statement

This place covers:

Ceramics based on refractory metal borides or refractory metal oxy-borides, Vanadium diboride (VB_2), Chromium boride (CrB or CrB_2), Niobium or tantalum diboride (NbB_2 or TaB_2), Molybdenum boride (Mo_2B or Mo_2B_5), Tungsten boride (W_2B, WB or W_2B_5)

References

Limiting references

This place does not cover:

Refractory borides other than refractory metal borides, e.g. a silicon boride refractory	C04B 35/5805
Cemented refractory borides	C22C 29/14

Informative references

Attention is drawn to the following places, which may be of interest for search:

Oxide ceramics based on vanadium, niobium, tantalum, molybdenum or tungsten oxides or solid solutions thereof with other oxides, e.g. vanadates, niobates, tantalates, molybdates or tungstates	C04B 35/495 and subgroups
Refractory metal carbide ceramics	C04B 35/5607 and subgroups
Refractory metal nitride ceramics	C04B 35/58007 and subgroups
Refractory metal silicide ceramics	C04B 35/58092 and subgroups
Refractory mortars or monolithic refractories	C04B 35/66
Refractory metal borides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. TiB_2, HfB_2	C04B 2235/3813
Refractory metals as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. titanium (Ti), chromium (Cr), tantalum (Ta)	C04B 2235/404
Coating or prosthesis-covering structure made of compounds based on chromium boride	A61F 2310/00694
Coating or prosthesis-covering structure made of compounds based on molybdenum boride	A61F 2310/00712
Coating or prosthesis-covering structure made of compounds based on vanadium boride	A61F 2310/00712
Coating or prosthesis-covering structure made of compounds based on tungsten boride	A61F 2310/0079

C04B 35/58071

{based on titanium borides}

Definition statement

This place covers:

Ceramics based on titanium borides or titanium oxy-borides, Titanium diboride (TiB_2)

References

Limiting references

This place does not cover:

Titanium oxide based ceramics	C04B 35/46 and subgroups
Titanium (oxy)carbide based ceramics	C04B 35/5611 and subgroups
Titanium (oxy)nitride based ceramics	C04B 35/58014 and subgroup
Titanium (oxy)silicide based ceramics	C04B 35/58092

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or prosthesis-covering structure made of compounds based on titanium borides	**K61F2/00L22B8T**

Special rules of classification

In the case of mixed refractory borides, e.g. TiCrB, both C04B 35/58064 (for the Cr) and C04B 35/58071 are added, since the amount of Ti and Cr is the same. $Ti_{0.9}Cr_{1.1}B$ is only classified in C04B 35/58064.

C04B 35/58078

{based on zirconium or hafnium borides}

Definition statement

This place covers:

Ceramics based on zirconium borides or zirconium oxy-borides, Zirconium of hafnium diboride (ZrB_2 or HfB_2).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Zirconium oxide based ceramics	C04B 35/48 and subgroups
Zirconium or hafnium (oxy)carbide ceramics	C04B 35/5622
Zirconium or hafnium (oxy)nitride ceramics	C04B 35/58028 and subgroup
Coating or prosthesis-covering structure made of compounds based on zirconium borides	A61F 2310/00706

Special rules of classification

In the case of mixed refractory borides, e.g. ZrTiB, both C04B 35/58071 (for the Ti) and C04B 35/58078 are added, since the amount of Ti and Zr is the same. $Ti_{0.9}Zr_{1.1}B$ is only classified in C04B 35/58078.

C04B 35/58085

{based on silicides}

Definition statement

This place covers:

Ceramics based on silicides or oxy-silicides

References

Limiting references

This place does not cover:

Silicides containing a metallic binder	C22C 29/18

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating ceramic substrates with silicides	C04B 41/5071
Silicides as starting material for making a ceramic or as secondary phase of a sintered ceramic, i.e. chemical compounds between silicon and a one or more metals, e.g. chromium silicide ($CrSi_2$), molybdenum disilicide ($MoSi_2$), iron silicide (FeSi, $FeSi_2$), cobalt silicide (Co_2Si, CoSi, $CoSi_2$)	C04B 2235/3891
Metal as starting material for making ceramics or as secondary phase of a sintered ceramic, not being present as a binding phase, e.g. La, Y, Mn, Re, Zn, Ga, In, Ge, Sb, Pb, Bi	C04B 2235/40 and subgroups
Silicon as starting material for making a ceramic or as secondary phase of a sintered ceramic	C04B 2235/428
The preparation of metal silicide powders	C01B 33/06
Materials for coating a single layer on glass: carbides, silicides	C03C 2217/282
Making hard metals based on borides, carbides, nitrides, oxides or silicides; preparation of the powder mixture used as the starting material	C22C 1/051
Making hard metals based on borides, carbides, nitrides, oxides, silicides starting from a melt	C22C 1/1068
Alloys based on silicides	C22C 29/18
Forming inorganic semiconducting materials on a substrate, the substrate being conductive materials, e.g. metallic silicides	H01L 21/02425, H01L 21/02425
Manufacture or treatment of semiconductor devices or of parts thereof, the devices having at least one potential-jump barrier or surface barrier, e.g. PN junction, depletion layer, carrier concentration layer, the devices having semiconductor bodies comprising elements of the fourth group of the Periodic System or AIIIBV compounds with or without impurities, e.g. doping material; Deposition of semiconductor materials on a substrate, e.g. epitaxial growth the substrate being of crystalline conducting material, e.g. metallic silicides	H01L 21/02425
Making conductor-insulator-semiconductor electrodes the final conductor layer being next to the insulator being silicon, e.g. polysilicon, with or without impurities, the conductor comprising a silicide layer formed by the silicidation reaction of silicon with a metal layer	H01L 21/28052, H01L 21/28052
Making conductor-insulator-semiconductor electrodes the final conductor layer being next to the insulator being silicon, e.g. polysilicon, with or without impurities, the conductor comprising a metal or metallic silicIde formed by deposition, e.g. sputter deposition, i.e. without a silicidation reaction	H01L 21/28061, H01L 21/28061
Making conductor-insulator-semiconductor electrodes the insulator being formed after the semiconductor body, the semiconductor being silicon the final conductor layer next to the insulator being a metallic silicide	H01L 21/28097, H01L 21/28097

Manufacture of electrodes on semiconductor bodies from a gas or vapour, e.g. condensation of conductive layers on semiconductor bodies comprising elements of the fourth group of the Periodic System the conductive layers comprising silicides	H01L 21/28518, H01L 21/28518
Field-effect transistors with an insulated gate using self aligned silicidation, i.e. silicide	H01L 21/28518 and subgroup
Treatment of semiconductor bodies to form insulating layers thereon; deposition of non-insulating-, e.g. conductive- or resistive-, layers on insulating layers; after-treatment of these layer; deposition of metallic of metal-silicide layers	H01L 21/32053, H01L 21/32053
Applying interconnections to be used for carrying current between separate components within a device characterised by the formation and the after-treatment of the conductors; modifying permanently or temporarily the pattern or the conductivity of conductive members, e.g. formation of alloys, reduction of contact resistances by forming silicides of refractory metals	H01L 21/76889, H01L 21/76889
MIS technology , i.e. integration processes of field effect transistors of the conductor-insulator-semiconductor type with a particular manufacturing method of the gate conductors; silicided or salicided gate conductors	H01L 21/823443, H01L 21/823443
MIS technology , i.e. integration processes of field effect transistors of the conductor-insulator-semiconductor type; complementary field-effect transistors, e.g. CMOS with a particular manufacturing method of the gate conductors; silicided or salicided gate conductors	H01L 21/823835, H01L 21/823835
Metal-insulator-semiconductor electrodes, the conductor material next to the insulator being a composite material, e.g. a silicide layer, e.g. TiSi2	H01L 29/4975, H01L 29/4975
Heater elements characterised by the composition or nature of the materials or by the arrangement of the conductor: silicon, e.g. silicon carbide, magnesium silicide, heating transistors or diodes	H05B 3/148

C04B 35/58092

{based on refractory metal silicides}

Definition statement

This place covers:

Ceramics based on refractory metal silicides or refractory metal oxy-silicides

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Oxide ceramics based on vanadium, niobium, tantalum, molybdenum or tungsten oxides or solid solutions thereof with other oxides, e.g. vanadates, niobates, tantalates, molybdates or tungstates	C04B 35/495 and subgroups
Refractory metal carbide ceramics	C04B 35/5607 and subgroups
Refractory metal nitride ceramics	C04B 35/58007 and subgroups
Refractory metal boride ceramics	C04B 35/58064 and subgroups

Refractory mortars or monolithic refractories	C04B 35/66
Metal-insulator-semiconductor electrodes the conductor material next to the insulator being a silicide layer, e.g. $TiSi_2$	H01L 29/4975, H01L 29/4975

Special rules of classification

In the case of mixed silicides, e.g. $MoFeSi_x$ both C04B 35/58092 (for the Mo) and C04B 35/58085 (for the Fe) are added, since the amount of Mo and Fe is the same. $Fe_{0.9}Mo_{1.1}Si_x$ is only classified in C04B 35/58092.

C04B 35/581

based on aluminium nitride

Definition statement

This place covers:

Ceramics based on aluminium nitrides or aluminium oxynitrides or aluminium carbonitrides

References

Limiting references

This place does not cover:

Ceramics based on aluminium silicon oxynitride (Sialon)	C04B 35/597
Nitrides containing a metallic binder	C22C 29/16

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: granular materials, Aluminium nitride	C04B 14/326
Ceramics based on aluminium carbide	C04B 35/56
Ceramics based on aluminium boride	C04B 35/5805
Coating or impregnating ceramic substrates with aluminium nitride	C04B 41/5063
Aluminum nitrides as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3865 and subgroup
Aluminium as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/402
Aluminum nitride substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/366
Materials for prostheses based on aluminium nitride	A61F 2310/00311
Coatings for prostheses based on aluminium nitride	A61F 2310/00868
High pressure synthesis of aluminium nitrides	B01J 2203/067
The preparation of aluminium nitride powders per se, not preparative to the making of nitride ceramics	C01B 21/072, C01B 21/072 and subgroups, C01B 21/0825 (oxy-nitrides)

Aluminium nitride ceramics in machines or engines in general (F01) or machines for liquids (F04)	F05C 2203/0834

Special rules of classification

Silicon-aluminium-oxynitrides are all in C04B 35/597. Silicon-aluminium-nitrides are in C04B 35/581 if the amount of aluminium is larger and in C04B 35/584 and subgroups if the amount of silicon is larger.

C04B 35/583

based on boron nitride

Definition statement

This place covers:

Ceramics based on boron nitrides or boron oxynitrides or boron carbonitrides, having for instant the hexagonal phase

References

Limiting references

This place does not cover:

Nitrides containing a metallic binder	C22C 29/16

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on boron carbide	C04B 35/563
Making fibres based on boron nitride	C04B 35/6229
Coating or impregnating ceramic substrates with boron nitride	C04B 41/5064
Boron oxide or borate as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3409
Boron nitride starting material for making ceramics or secondary phase of a sintered ceramic	C04B 2235/386
Boron as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/421
Boron-containing organic compounds becoming part of a ceramic after heat treatment, e.g. borazine, borane or boranyl	C04B 2235/486
Boron nitride substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/361
Materials for prostheses based on boron nitride	A61F 2310/00305
Coatings for prostheses based on boron nitride	A61F 2310/00862
Presses for the formation of diamonds or boronitride	B01J 3/065 and subgroup
High pressure synthesis of boronitrides	B01J 2203/066
The preparation of boron nitride powders per se, not preparative to the making of nitride ceramics	C01B 21/064, C01B 21/064 and subgroups
Alloys containing diamond or cubic or wurtzitic boron nitride, fullerenes or carbon nanotubes	C22C 26/00

Alloys based on nitrides	C22C 29/16
Boron nitride ceramics in machines or engines in general (F01) or machines for liquids (F04)	F05C 2203/0839

Special rules of classification

Materials of silicon boron nitride are classified in C04B 35/583 if the amount of boron is larger than the amount of silicon and in C04B 35/584 and subgroups if the amount of silicon is larger. The same accounts for aluminium boron nitrides and other mixed boron nitrides.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

hBN	Hexagonal boron nitride

C04B 35/5831

based on cubic boron nitrides {or Wurtzitic boron nitrides, including crystal structure transformation of powder}

Definition statement

This place covers:

Ceramics based on boron nitrides, boron oxynitrides or boron carbonitrides, having the cubic structure

References

Limiting references

This place does not cover:

Nitrides containing a metallic binder	C22C 29/16

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

cBN	Cubic boron nitride

C04B 35/584

based on silicon nitride

Definition statement

This place covers:

Ceramics based on silicon nitrides or silicon carbonitrides

References

Limiting references

This place does not cover:

Silicon oxynitride	C04B 35/597

Nitrides containing a metallic binder	C22C 29/16

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on silicon oxide	C04B 35/14
Ceramics based on silicon carbide	C04B 35/565 and subgroups
Ceramics based on silicon boride	C04B 35/5805
Making fibres based on silicon nitrides	C04B 35/62295
Coating or impregnating ceramic substrates with silicon nitride	C04B 41/5066
Silicon nitrides as starting material for making a ceramic or as secondary phase of a sintered ceramic, e.g. Si_3N_4, silicon carbonitride or silicon oxynitride (SiON)	C04B 2235/3873 and subgroups
Si-containing organic compounds becoming part of a ceramic after heat treatment, e.g. silicone resins, (poly)silanes, (poly)siloxanes or (poly)silazanes	C04B 2235/483
Silicon nitride substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/368
Materials for prostheses based on silicon nitride	A61F 2310/00317
Coatings based on silicon nitride on prostheses	A61F 2310/00874
The preparation of silicon nitride powders per se, not preparative to the making of nitride ceramics	C01B 21/068, C01B 21/068 and subgroups, C01B 21/0823 (oxy-nitrides)
Silicon nitride ceramics in machines or engines in general (F01) or machines for liquids (F04)	F05C 2203/0843
Manufacture or treatment of semiconductor devices or of parts thereof: forming insulating materials on a substrate the material being a silicon nitride not containing oxygen, e.g. Si_xN_y or $Si_xB_yN_z$	H01L 21/0217, H01L 21/0217
Treatment of semiconductor bodies to form insulating layers thereon, e.g. for masking or by using photolithographic techniques composed of silicon nitrides	H01L 21/3185, H01L 21/3185
Thin film transistors having a semiconductor body comprising semiconductor materials of the fourth group not being silicon, or alloys including an element of the group IV, e.g. Ge, SiN alloys, SiC alloys	H01L 29/78684, H01L 29/78684 and subgroup

Special rules of classification

In the case of mixed nitrides, e.g. SiBN, both C04B 35/584 (for the Si) and C04B 35/583 are added, since the amount of B and Si is the same. $Si_{0.9}B_{1.1}N$ is only classified in C04B 35/583 (possibly using an additional symbol (CCA) to indicate the presence of Si, e.g. C04B 2235/3873 or C04B 2235/428). $B_{0.9}Si_{1.1}N$ is only classified in C04B 35/584 or subgroup of C04B 35/584 (possibly using an additional symbol (CCA) to indicate the presence of B, e.g. C04B 2235/386 or C04B 2235/421).

For all other mixed nitrides containing Si the reasoning is as with SiBN, classification is in the nitride group of the metal element that is most abundant.

If the main phase is alpha Si_3N_4, C04B 2235/766 (trigonal symmetry) is attributed, if the main phase is beta Si_3N_4, C04B 2235/767 (hexagonal symmetry) is attributed.

C04B 35/587

Fine ceramics

Definition statement

This place covers:

Silicon nitride ceramics having grains smaller than 100 microns.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Using particles of size 1-100 microns for making the ceramic	C04B 2235/5436

Special rules of classification

This class is not used in practice. All silicon nitride ceramics are either in C04B 35/584 or in C04B 35/589-C04B 35/5935.

C04B 35/589

obtained from {Si-containing} polymer precursors {or organosilicon monomers}

Definition statement

This place covers:

Silicon nitride or carbonitride ceramics made by pyrolysing silicone resins, (poly)silanes, (poly)siloxanes, (poly)silazanes etc., or porous ceramics that are infiltrated with a silicon-containing resin and pyrolysed to a product that contains mainly silicon nitride or carbonitride

References

Limiting references

This place does not cover:

Porous carbon is infiltrated with Si-containing polymer that is carbonised to form a product containing mainly carbon	C04B 35/521
Carbon and silicon containing polymers are carbonised, leading to a product that has as largest fraction a carbon phase	C04B 35/524

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on carbon obtained from polymer or organic precursors	C04B 35/524
Ceramics based on silicon carbide obtained from polymer or organic precursors	C04B 35/571

Si-containing organic compounds, e.g. silicone resins, (poly)silanes, (poly)siloxanes or (poly)silazanes used for becoming part of a ceramic after heat-treatment, e.g. phenol resins	C04B 2235/483

Special rules of classification

The end-product of the pyrolysis needs to have as largest fraction a silicon nitride phase. If after pyrolysis the product is hot-pressed, C04B 35/593 is added as well.

C04B 35/591

obtained by reaction sintering

Definition statement

This place covers:

A nitrogen containing material and a silicon containing material are reacted to form in-situ a Si_3N_4 containing ceramics, e.g. a silicon body is infiltrated with gaseous N_2 and reacted to Si_3N_4

References

Limiting references

This place does not cover:

Infiltration of porous silicon product with nitrogen, with the end-product containing more unreacted silicon phase than Si_3N_4	C04B 41/45 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Reaction sintering to make silicon carbide based ceramics	C04B 35/571
Reaction sintering to make ceramics in general	C04B 35/65 and subgroups
Silicon as starting material for making a ceramic or as secondary phase of a sintered ceramic	C04B 2235/428
Gases other than oxygen used as reactant for making a ceramic phase, e.g. nitrogen used to make a nitride phase	C04B 2235/46 and subgroup
Treatment of semiconductor bodies to form insulating layers thereon, e.g. for masking or by using photolithographic techniques: deposition of non-insulating-, e.g. conductive- or resistive-, layers on insulating layers; after treatment: nitridation of silicon-containing layers	H01L 21/3211

Special rules of classification

The end-product of the reaction sintering needs to have as largest fraction a silicon nitride phase. If after reaction sintering the product is hot-pressed, C04B 35/593 is added as well. Silicon is not regarded as a metallic phase, thus silicon nitride materials that contain a large amount of silicon phase are not regarded as ceramics having a metallic binder, which are classified in C22C 29/00 and subgroups, but as a ceramic with a secondary phase.

When classifying in C04B 35/591, classification in C04B 35/65 is superfluous.

C04B 35/593

obtained by pressure sintering

Definition statement

This place covers:

A Si_3N_4-containing or forming material is densified under mechanical pressure, leading to a product having Si_3N_4 as the largest fraction.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pressure sintering to make silicon carbide based ceramics	C04B 35/575
Pressure sintering to make ceramics in general	C04B 35/645

Special rules of classification

When classifying in C04B 35/593, classification in C04B 35/645 is superfluous. C04B 35/593 can be used in combination with C04B 35/589 or C04B 35/591, when pressure sintering a silicon containing polymer respectively when pressure sintering a reaction sintered Si_3N_4 based ceramic.

C04B 35/5935

{obtained by gas pressure sintering}

Definition statement

This place covers:

A Si_3N_4-containing or forming material is densified under gas pressure, leading to a product having Si_3N_4 as the largest fraction.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Gas pressure sintering to make silicon carbide based ceramics	C04B 35/5755
Hot isostatic pressing to make ceramics in general	C04B 35/6455

Special rules of classification

When classifying in C04B 35/5935, classification in C04B 35/6455 is superfluous. C04B 35/5935 can be used in combination with C04B 35/589 or C04B 35/591, when gas pressure sintering a silicon containing polymer respectively when gas pressure sintering a reaction sintered Si_3N_4 based ceramic.

C04B 35/597

based on silicon oxynitride, {e.g. SIALONS}

Definition statement

This place covers:

Ceramics based on oxynitrides containing both aluminium and silicon, possibly further containing rare earths

References

Limiting references

This place does not cover:

Aluminium oxynitride based ceramics	C04B 35/581

Informative references

Attention is drawn to the following places, which may be of interest for search:

Aluminium nitride based ceramics	C04B 35/581
Silicon nitride based ceramics	C04B 35/584 and subgroups
Coating or impregnating ceramic substrates with silicon oxynitrides, e.g. SIALON	C04B 41/5067
Aluminium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. bauxite, alpha-alumina	C04B 2235/3217 and subgroups
Silicon oxide, silicic acids, or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. silica sol, fused silica, silica fume, cristobalite, quartz or flint (glass constituents C04B 2235/36), e.g. silicic acid $H_2Si_2O_5$	C04B 2235/3418
Aluminum nitrides as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3865 and subgroup
Aluminum oxynitrides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. AlON or sialon	C04B 2235/3869
Silicon nitrides as starting material for making a ceramic or as secondary phase of a sintered ceramic, e.g. Si_3N_4, silicon carbonitride or silicon oxynitride (SiON)	C04B 2235/3873 and subgroups
Aluminium as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/402
Silicon as starting material for making a ceramic or as secondary phase of a sintered ceramic	C04B 2235/428
The preparation of sion powders per se, not preparative to the making of nitride ceramics	C01B 21/0823
The preparation of sialon powders per se, not preparative to the making of nitride ceramics	C01B 21/0826
Silicon oxy-nitride glasses	C03B 2201/24, C03C 2201/24
Silicon oxycarbide, oxynitride or oxycarbonitride glasses	C03C 3/045

Manufacture or treatment of semiconductor devices or of parts thereof: forming insulating materials on a substrate: the material being a silicon oxynitride, e.g. SiON or SiON:H	H01L 21/0214, H01L 21/0214
Manufacture or treatment of semiconductor devices or of parts thereof: forming insulating materials on a substrate the material being a nitride into which oxygen is introduced, e.g. changing SiN to SiON	H01L 21/02326, H01L 21/02326
Manufacture or treatment of semiconductor devices or of parts thereof: forming insulating materials on a substrate the material being an oxide into which nitrogen is introduced, e.g. changing SiO to SiON	H01L 21/02332, H01L 21/02332

C04B 35/622

Forming processes; Processing powders of inorganic compounds preparatory to the manufacturing of ceramic products

Definition statement

This place covers:

All processes for producing and treating ceramic powders or powders that are used for making ceramics, where these powders subsequently are used to make shaped ceramics. Making and treating ceramic fibers. Additives used for shaping ceramics. The shaping of (pre)ceramic powders or slurries. Heat treatments of (pre)ceramic powders and shaped ceramic materials.

Relationships with other classification places

working by grinding or polishing B24

Mechanical features relating to the shaping of clay or other ceramic compositions, B28B

Preparing clay or like ceramic compositions; Producing mixtures containing clay or like ceramic compositions B28C

Working stone or stone-like materials B28D

Layered products B32B

Chemical preparations of powders of inorganic compounds C01

References

Limiting references

This place does not cover:

After- treatment of ceramics, e.g. coating or impregnation	C04B 41/00
Articles characterised by particular shape, e.g. linings for casting ladles, tundishes, cups or the like	B22D 41/02
Injection moulding of clay or other ceramic compositions	B28B 1/24
Slip-casting clay or other ceramic compositions	B28B 1/26
Applying clay or other ceramic compositions on to a core to form a layer thereon	B28B 1/30

Informative references

Attention is drawn to the following places, which may be of interest for search:

Aspects relating to the preparation, properties or mechanical treatment of green bodies or pre-forms	C04B 2235/60 and subgroups
Patterns for foundry moulding; Manufacture thereof so far as not provided for in other classes	B22C 7/00
Manufacture of workpieces or articles from metallic powder characterised by the manner of sintering by using electric current, laser radiation or plasma	B22F 3/105
Working by laser beam	B23K 26/00
Layered products essentially comprising ceramics, e.g. refractory products	B32B 18/00
Photomechanical, e.g. photolithographic, production of textured or patterned surfaces	G03F 7/00
Exposure, e.g. with laser beam	G03F 7/20

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Rapid Prototyping (RP)	RP is a forming method in which resin or powder material is used. RP devices build up a prototype body layer by layer, rapidly generating a three-dimensional free form. In the ceramic art, two kinds of RP are mainly applied. One is "3D Printing", the other is "Selective Laser Sintering" (see glossary of C04B 35/64).
3D Printing (3DP)	3DP is a general forming technique which is also used in the ceramic art, developed from stereolithography. Light-sensitive monomers are polymerised by a laser beam and solidified by gelation in this way. Through the gelation and solidification of aqueous ceramic slurry, which contains the light-sensitive monomer, a component is built up in layers.

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- “Rapid Prototyping technologies", "Solid Freeform Fabrication", "Layer Manufacturing technologies " and "Desktop Manufacturing"

C04B 35/62204

{using waste materials or refuse (clay-wares containing waste materials C04B 33/132)}

Definition statement

This place covers:

Waste material is mixed with ceramic or refractory material to be sintered into a ceramic or refractory product

Relationships with other classification places

Disposal of solid waste B09B

References

Limiting references

This place does not cover:

Waste material is mixed with clay to make a fired clay product	C04B 33/132 and subgroups
Alumino-silicate products made by sintering waste materials, without adding any clay or ceramic material.	C04B 33/1328
Waste materials that are added to the ceramic material to create porosity after a heat treatment	C04B 38/065
Removing ash, clinker, or slag from combustion chamber	F23J 1/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cements containing slag	C04B 7/14 and subgroups
Use of waste materials or refuse as fillers for mortars, concrete or artificial stone	C04B 18/04 and subgroups
Use of agglomerated or waste materials or refuse as fillers for mortars, concrete or artificial stone, or treatment of agglomerated or waste materials or refuse, specially adapted to enhance their filling properties in mortars, concrete or artificial stone: waste material from metallurgical processes being silica fume	C04B 18/146 and subgroups
Use of inorganic materials as active ingredients for mortars, concrete or artificial stone, e.g. accelerators: waste inorganic materials	C04B 22/0006
Coating or impregnating of mortars, concrete, artificial stone or ceramics with waste materials	C04B 41/4598
Manufacture of articles from scrap or waste metal particles	B22F 8/00
Active carbon from waste materials, e.g. tyres, spent sulphite pulp liquor	C01B 31/081
Preparation of alkali metal aluminates; Aluminium oxide or hydroxide there from by treating aluminous minerals or waste-like raw materials with alkali hydroxide,	C01F 7/06
Melting in furnaces of glass-forming waste materials	C03B 5/005
Use of waste materials, e.g. slags as ingredients generally applicable to manufacture of glasses, glazes, or vitreous enamels	C03C 1/002
Devitrified glass ceramics containing waste materials, e.g. slags	C03C 10/0063
Foundations for pavings characterised by material or composition used, e.g. waste or recycled material	E01C 3/003

C04B 35/62209

{using woody material, remaining in the ceramic products (to obtain porous material by burning out C04B 38/06)}

Definition statement

This place covers:

Wood materials are carbonised to make a carbon product, which could be further reacted with silicon to make silicon carbide, e.g. cellulose is carbonised and becomes part of a ceramic object.

References

Limiting references

This place does not cover:

Burning out woody material, e.g. cellulose, to obtain a porous ceramic	C04B 38/06

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of waste materials or refuse as fillers for mortars, concrete or artificial stone: combustion residues from burning wood	C04B 18/068
Use of waste materials or refuse as fillers for mortars, concrete or artificial stone: wood, e.g. sawdust, wood shaving	C04B 18/26 and subgroup
Using cellulose as additive for making ceramics	C04B 35/6365
Organic compounds becoming part of a ceramic after heat treatment, e.g. carbonising phenol resins	C04B 2235/48 and subgroups
Incinerators or other apparatus for consuming industrial waste, of wood waste	F23G 7/105

C04B 35/62213

{using rice material, e.g. bran or hulls or husks}

Definition statement

This place covers:

Rice bran or rice hulls are pyrolysed into silicon oxide material or are treated in reducing atmosphere to make a silicon (oxy)carbide material.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of waste materials or refuse as fillers for mortars, concrete or artificial stone: combustion residues: burned rice husks or other burned vegetable material	C04B 18/101
Use of waste materials or refuse as fillers for mortars, concrete or artificial stone: vegetable refuse, e.g. rice husks, maize-ear refuse; Cellulosic materials, e.g. paper, cork	C04B 18/24 and subgroups

Silicon oxide, silicic acids, or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. silica sol, fused silica, silica fume, cristobalite, quartz or flint (glass constituents C04B 2235/36), e.g. silicic acid $H_2Si_2O_5$	C04B 2235/3418
Silicon carbides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. SiC or SiOC	C04B 2235/3826 and subgroups

C04B 35/62218

{obtaining ceramic films, e.g. by using temporary supports}

Definition statement

This place covers:

Obtaining free-standing ceramic films or sheets, e.g. making ceramic paper, ceramic layers, where the emphasis lies on how to obtain the free-standing film, e.g. through tape casting, or using a method that is normally used for making coatings, to make a free-standing film, e.g., CVD. Not meant for standard tape casting or standard sheet making.

Relationships with other classification places

Obtaining ceramic films that remain on a metallic substrate C23C

References

Limiting references

This place does not cover:

Obtaining ceramic films that remain on a substrate of mortars, concrete, artificial or natural stone or ceramics	C04B 41/45 and subgroups
Making ceramic tapes by tape casting	C04B 2235/6025
Obtaining ceramic films that remain on a glass substrate	C03C 17/00, C03C 2217/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Laminating ceramic pre-shaped layers	B32B 18/00

Special rules of classification

If the symbol C04B 2235/6025 is given, C04B 35/62218 could be given as well, since tape casting always leads to a freestanding film. This is normally not done, however. Only if there are new or special aspects in the tape casting process also C04B 35/62218 is given.

C04B 35/62222

{obtaining ceramic coatings (coating of mortars, concrete, artificial or natural stone or ceramics C04B 41/45; laminated ceramic products B32B 18/00; coating metallic materials C23; coating of glass C03C 17/00, applying ceramic coatings on silicon for semi-conductor purposes H01L)}

Definition statement

This place covers:

Ceramic coatings on bulk objects, where the substrate is not defined, making it impossible to classify in C03C 17/00, C04B 41/00, C23C, H01 or any other field where ceramic coatings could be classified. This is for instance the case when making thick coatings from suspensions, such as by screen printing, on an undefined substrate.

Relationships with other classification places

Obtaining ceramic films that remain on a metallic substrate C23C

Obtaining ceramic coatings on silicon for semi-conductor purposes H01L

References

Limiting references

This place does not cover:

Obtaining ceramic coatings on inorganic particles that are subsequently used in a ceramic material	C04B 35/62802
Obtaining ceramic coatings on inorganic fibers that are subsequently used in a ceramic material	C04B 35/62844
Obtaining ceramic coatings that remain on a substrate of mortars, concrete, artificial or natural stone or ceramics	C04B 41/45 and subgroups
Linings or coatings, e.g. removable, absorbent linings, permanent anti-stick coatings; Linings becoming a non-permanent layer of the moulded article of Moulds; Cores; Mandrel	B28B 7/36, B28B 7/36 and subgroups
Mechanical aspects of coating ceramic objects	B28B 11/04, B28B 11/04, B28B 19/00, B28B 19/00 and subgroups
Obtaining ceramic coatings that remain on a glass substrate	C03C 17/00, C03C 2217/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Mechanical aspects of coating ceramic tubes	B28B 21/94, B28B 21/94
Laminating ceramic pre-shaped layers	B32B 18/00

Special rules of classification

In practice this class is hardly used. Examples of documents where this class has been used are EP1186579 and WO9818741.

C04B 35/62227

{obtaining fibres}

Definition statement

This place covers:

All documents describing the synthesis of ceramic fibers, both oxide and non-oxide fibers, except for carbon fibers, and all documents that describe ceramic fibers having a new or uncommon composition. The fibers can be obtained either in individual form or in certain shaped form, such as woven fibers. Also for the synthesis of (nano) wires, whiskers, needles, pins.

Relationships with other classification places

Obtaining fibers or threads in general D01

References

Limiting references

This place does not cover:

Coating of ceramic fibers	C04B 35/62844 and subgroups
Making metallic fibers per se	B22F 1/004
The synthesis of glass fibers	C03B 37/01 and subgroups
Glass-ceramic fiber compositions	C03C 13/006
The synthesis of carbon fibers	D01F 9/12, D10B 2101/12

Informative references

Attention is drawn to the following places, which may be of interest for search:

Clay wares reinforced with fibers	C04B 33/36
Coating ceramic and carbon fibers	C04B 35/62844 and subgroups
Ceramic material reinforced with fibers	C04B 35/71 and subgroups, e.g. C04B 35/83, C/C composites
Fibers used in ceramic compositions	C04B 2235/5208 and subgroups
Mechanical aspects of shaping ceramic objects containing fibers	B28B 1/52
Glass fibre or filament compositions	C03C 13/00 and subgroups
Use of inorganic fibers as ingredient for polymers	C08K 7/02 and subgroups
Fibers of inorganic material, not being glass or ceramic	D01F 9/12

Special rules of classification

The method of making the fibers is usually classified in D01, e.g. spinning or electro-spinning ceramic fibers.

If the making of ceramic fibers is not described but just the use of them in a ceramic composite is mentioned, C04B 35/62227 is not used, but C04B 2235/5208 and its subgroups together with C04B 35/80 and it's subgroups.

The making of ceramic fibers is normally not classified in the general oxide classes C04B 35/01-C04B 35/51 or general non-oxide classes C04B 35/515-C04B 35/597, unless the fiber composition is a new composition for that material in general or in the case the synthesis contains a new aspect that would be applicable also for making a bulk ceramic, e.g. using a new combination of starting materials that also could be used to make a bulk ceramic.

C04B 35/62231

{based on oxide ceramics}

Definition statement

This place covers:

The obtaining of ceramic fibers based on oxide ceramics, e.g. ferrite, manganite, chromite, fibers

References

Limiting references

This place does not cover:

Coating fibers with oxide ceramic	C04B 35/62847 and subgroups
The obtaining of glass-ceramic fibers	C03C 13/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Oxidic fibers as filler for concrete, cement, mortar or artificial stone	C04B 14/46 and subgroups
Obtaining oxide ceramics in general	C04B 35/01 and subgroups
Metal oxides, mixed metal oxides or oxide forming salts thereof, e.g. carbonates, nitrates, (oxy)hydroxides, chlorides, as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/32 and subgroups
Non-metal oxides, mixed non-metal oxides or oxide forming salts thereof, e.g. carbonates, nitrates, (oxy)hydroxides, chlorides, as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/34 and subgroups
Use of fibers based on oxides in making ceramics	C04B 2235/522
Use of inorganic oxygen-containing fibers as ingredient for polymers	C08K 7/08
Inorganic fibres based on oxides or oxide ceramics, e.g. silicates, Ceramic	D10B 2101/08

C04B 35/62236

{Fibres based on aluminium oxide}

Definition statement

This place covers:

The obtaining of ceramic fibers based on aluminium oxide ceramics, e.g. spinel, alumina, YAG (yttrium aluminate garnet) fibers

References

Limiting references

This place does not cover:

The obtaining of fibers based on alumino-silicates	C04B 35/62245
Coating fibers with alumina or aluminates	C04B 35/62852

Informative references

Attention is drawn to the following places, which may be of interest for search:

Alumina fibers as filler for concrete, cement, mortar or artificial stone	C04B 14/4625
Obtaining alumina-based ceramics in general	C04B 35/10 and subgroups
Obtaining aluminate-based ceramics in general	C04B 35/44 and subgroup
Aluminium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. bauxite, alpha-alumina	C04B 2235/3217 and subgroups
Use of alumina or aluminate fibers in making ceramics	C04B 2235/5224

C04B 35/6224

{Fibres based on silica}

Definition statement

This place covers:

The obtaining of ceramic fibers based on silicon oxide ceramics, e.g. silica, forsterite, wollastonite fibers

References

Limiting references

This place does not cover:

Coating fibers with silica or silicates	C04B 35/62849
The synthesis of silica based glass or glass-ceramic fibers	C03B 37/01 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Silica fibers as filler for concrete, cement, mortar or artificial stone	C04B 14/4631
Silicate fibers as filler for concrete, cement, mortar or artificial stone	C04B 14/4656 and subgroups
Obtaining silica-based ceramics in general	C04B 35/14
Obtaining silicate-based ceramics in general	C04B 35/16
Obtaining magnesium silicate-based ceramics in general	C04B 35/20
Obtaining calcium silicate-based ceramics in general	C04B 35/22
Silicon oxide, silicic acids, or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. silica sol, fused silica, silica fume, cristobalite, quartz or flint (glass constituents C04B 2235/36), e.g. silicic acid $H_2Si_2O_5$	C04B 2235/3418
Silicates other than clay as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. water glass (Na_2SiO_3)	C04B 2235/3427 and subgroups
Use of Silica or silicates other than aluminosilicates fibers in making ceramics	C04B 2235/5232
Use of inorganic silicon-containing fibers as ingredient for polymers	C08K 7/08 and subgroup

C04B 35/62245

{rich in aluminium oxide}

Definition statement

This place covers:

The obtaining of ceramic fibers based on alumino-silicate ceramics, e.g. mullite, cordierite, kyanite, zeolite, spodumene, vermiculite, albite, anorthite fibers

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Alumino-silicate fibers as filler for concrete, cement, mortar or artificial stone	C04B 14/4656
Obtaining alumino-silicate-based ceramics in general	C04B 35/18 and subgroups
Alumino-silicates other than clay as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. mullite ($3Al_2O_3$-$2SiO_2$)	C04B 2235/3463 and subgroups
Use of fibers based on Silica and alumina, including aluminosilicates in making ceramics	C04B 2235/5228

C04B 35/6225

{Fibres based on zirconium oxide, e.g. zirconates such as PZT}

Definition statement

This place covers:

The obtaining of ceramic fibers based on zirconium oxide ceramics, e.g. zirconia, YSZ (yttria-stabilised-zirconia), zircon, zirconate, zirconate-titanates such as PZT (lead zirconate titanate) fibers

References

Limiting references

This place does not cover:

Coating fibers with refractory metal oxides	C04B 35/62855

Informative references

Attention is drawn to the following places, which may be of interest for search:

Zirconia or zircon fibers as filler for concrete, cement, mortar or artificial stone	C04B 14/4637
Obtaining zirconia or zirconate-based ceramics in general	C04B 35/48 and subgroups
Obtaining titanate-zirconate-based ceramics in general	C04B 35/49 and subgroups
Zirconium or hafnium oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. HfO_2	C04B 2235/3244 and subgroups
Use of fibers based on zirconia in making ceramics	C04B 2235/5236

C04B 35/62254

{Fibres based on copper oxide}

Definition statement

This place covers:

The obtaining of ceramic fibers based on copper oxide ceramics, e.g. cuprate fibers such as superconducting YBaCuO fibers

References

Limiting references

This place does not cover:

Obtaining copper oxide containing ferrite based fibers	C04B 35/62231

Informative references

Attention is drawn to the following places, which may be of interest for search:

Obtaining copper oxide or cuprate-based ceramics in general	C04B 35/45 and subgroups

Copper oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. CuO or Cu_2O	C04B 2235/3281 and subgroup
Processes peculiar to the manufacture or treatment of superconducting filaments or superconducting composite wires	H01L 39/248

C04B 35/62259

{Fibres based on titanium oxide}

Definition statement

This place covers:

The obtaining of ceramic fibers based on titanium oxide ceramics, e.g. titania such as rutile and anatase, titanates such as alkaline earth titanates, e.g. barium or strontium titanates, rare earth titanates, alkali titanates, lead titanates, bismuth titanates, aluminium titanates such as tialite

References

Limiting references

This place does not cover:

Zirconate-titanate fibers such as PZT fibers	C04B 35/6225
Coating fibers with refractory metal oxides	C04B 35/62855

Informative references

Attention is drawn to the following places, which may be of interest for search:

Titanate fibers as filler for concrete, cement, mortar or artificial stone	C04B 14/4681
Obtaining titania-based ceramics in general	C04B 35/46
Obtaining titanate-based ceramics in general	C04B 35/462 and subgroups
Titanium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. rutile or anatase	C04B 2235/3232 and subgroups

C04B 35/62263

{Fibres based on magnesium oxide}

Definition statement

This place covers:

The obtaining of ceramic fibers based on oxides based on single oxide phases of MgO or mixed oxides of MgO and CaO such as dolomite, or mixed oxides of MgO with either alkali metal oxides and/or rare earth oxides, in which the MgO forms the largest fraction. Mixed oxides of magnesia with zirconium oxide, in which the amount of magnesia is larger than the amount of zirconia, e.g. $Mg_{0.6}Zr_{0.4}O_x$

References

Limiting references

This place does not cover:

Obtaining magnesium ferrite based fibers	C04B 35/62231
Obtaining magnesium chromite based fibers	C04B 35/62231
Obtaining magnesium niobate based fibers	C04B 35/62231
Obtaining magnesium aluminate based fibers, such as spinel fibers	C04B 35/62236
Obtaining magnesium silicate based fibers, such as forsterite fibers	C04B 35/6224
Obtaining magnesium alumino silicate based fibers, such as cordierite fibers	C04B 35/62245
Obtaining magnesium zirconate based fibers	C04B 35/6225
Obtaining magnesium titanate zirconate based fibers	C04B 35/6225
Obtaining magnesium cuprate based fibers	C04B 35/62254
Obtaining magnesium titanate based fibers	C04B 35/62259
Obtaining magnesium phosphate based fibers	C04B 35/62268

Informative references

Attention is drawn to the following places, which may be of interest for search:

Obtaining magnesia based ceramics in general	C04B 35/04 and subgroups
Obtaining dolomite based ceramics in general	C04B 35/06
Magnesium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3206

C04B 35/62268

{Fibres based on metal phosphorus oxides, e.g. phosphates}

Definition statement

This place covers:

The obtaining of ceramic fibers based on inorganic phosphor-oxide compounds

References

Limiting references

This place does not cover:

Obtaining phosphide based fibers	C04B 35/62272
Coating fibers with metal salts, e.g. phosphates	C04B 35/62881

Informative references

Attention is drawn to the following places, which may be of interest for search:

Obtaining phosphate based ceramics in general	C04B 35/447

Calcium phosphate as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. hydroxyapatite	C04B 2235/3212
Phosphates or phosphites (calcium phosphates C04B 2235/3212) as starting material for making ceramics, e.g. orthophosphate (PO_4^{3-}), pyrophosphate ($P_2O_7^{4-}$), hypophosphite ($H_2PO_2^-$), or present as secondary phase in the sintered ceramic	C04B 2235/447
Preparation of phosphates per se, e.g. phosphates powder, not preparative to making a phosphates ceramic	C01B 25/26 and subgroups

C04B 35/62272

{based on non-oxide ceramics (carbon nanotubes C01B 31/0206; carbon fibers D01F 9/12)}

Definition statement

This place covers:

The obtaining of ceramic fibers based on ceramics having as the largest fraction a non-oxide material, e.g. a carbide, nitride, boride, silicide, fluoride, sulphide, selenide.

References

Limiting references

This place does not cover:

Coating fibers with non-oxide ceramics	C04B 35/62828 and subgroups
The synthesis of carbon nanotubes	C01B 31/0206
The synthesis of carbon fibers	D01F 9/12, D10B 2101/12

Informative references

Attention is drawn to the following places, which may be of interest for search:

Non-oxide fibers as filler for concrete, cement, mortar or artificial stone	C04B 14/4687 and subgroup
Obtaining non-oxide based ceramics in general	C04B 35/515 and subgroups
Non-oxides as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/38 and subgroups
Metal as starting material for making ceramics or as secondary phase of a sintered ceramic, not being present as a binding phase, e.g. La, Y, Mn, Re, Zn, Ga, In, Ge, Sb, Pb, Bi	C04B 2235/40 and subgroups
Use of fibers based on non-oxides in making ceramics	C04B 2235/524
Non-oxide glass compositions for glass fibers	C03C 13/041 and subgroups
Inorganic fibres based on Carbides; Nitrides; Silicides; Borides	D10B 2101/14 and subgroup

C04B 35/62277

{Fibres based on carbides}

Definition statement

This place covers:

The obtaining of ceramic fibers based on ceramics having as the largest fraction a carbide, e.g. boron carbide, titanium carbide, tungsten carbide, an oxy-carbide

References

Limiting references

This place does not cover:

The obtaining of carbo-nitride based fibers or whiskers	C04B 35/62286
Coating fibers with carbides	C04B 35/6286 and subgroup

Informative references

Attention is drawn to the following places, which may be of interest for search:

Obtaining carbide based ceramics in general	C04B 35/56 and subgroups
Carbides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. rare earth carbide	C04B 2235/3817 and subgroups
Carbon as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/422 and subgroups
Organic compounds becoming part of a ceramic after heat treatment, e.g. carbonising phenol resins	C04B 2235/48 and subgroups

C04B 35/62281

{based on silicon carbide (C04B 35/571 takes precedence)}

Definition statement

This place covers:

The obtaining of ceramic fibers based on ceramics having as the largest fraction a silicon carbide phase, e.g. alpha- or beta-silicon carbide or silicon oxy-carbide, silicon carbide whiskers

References

Limiting references

This place does not cover:

Carbon and silicon containing polymers are carbonised, leading to a product that has as largest fraction a silicon carbide phase, e.g. carbonising a shaped polysilane resin	C04B 35/571
Carbon, silicon and nitrogen containing polymers are carbonised, leading to a product that has as largest fraction a silicon nitride phase, e.g. carbonising a shaped polysilazane resin	C04B 35/589
The obtaining of silicon carbo-nitride based fibers or whiskers	C04B 35/62295

Coating fibers with silicon carbide	C04B 35/62863

Informative references

Attention is drawn to the following places, which may be of interest for search:

Silicon carbide fibers as filler for concrete, cement, mortar or artificial stone	C04B 14/4693
Obtaining silicon carbide based ceramics in general	C04B 35/565 and subgroups
Silicon carbides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. SiC or SiOC	C04B 2235/3826 and subgroups
Silicon as starting material for making a ceramic or as secondary phase of a sintered ceramic	C04B 2235/428
Si-containing organic compounds becoming part of a ceramic after heat treatment, e.g. silicone resins, (poly)silanes, (poly)siloxanes or (poly)silazanes	C04B 2235/483
Use of fibers based on silicon carbide in making ceramics	C04B 2235/5244
Inorganic fibres based on Silicon carbide	D10B 2101/16

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

SiC/SiC	Silicon carbide reinforced with silicon carbide fibers

C04B 35/62286

{Fibres based on nitrides}

Definition statement

This place covers:

The obtaining of ceramic fibers based on ceramics having as the largest fraction a nitride, e.g. aluminium nitride, titanium nitride, tungsten nitride, a carbonitride phase, an oxy-nitride such as AlON

References

Limiting references

This place does not cover:

Coating fibers with nitrides	C04B 35/62865 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Obtaining nitride based ceramics in general	C04B 35/58 and subgroups

Nitrides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. oxynitrides, carbonitrides, oxycarbonitrides, lithium nitride (Li_3N), magnesium nitride (Mg_3N_2), rare earth nitride, iron group metal nitrides	C04B 2235/3852 and subgroups
Gases other than oxygen used as reactant for making a ceramic phase, e.g. nitrogen used to make a nitride phase	C04B 2235/46 and subgroup

C04B 35/6229

{based on boron nitride}

Definition statement

This place covers:

The obtaining of ceramic fibers based on ceramics having as the largest fraction a boron nitride phase, e.g. hexagonal boron nitride, cubic boron nitride, boron carbonitride

References

Limiting references

This place does not cover:

Coating fibers with boron nitride	C04B 35/62868

Informative references

Attention is drawn to the following places, which may be of interest for search:

Obtaining boron nitride based ceramics in general	C04B 35/583 and subgroup
Boron oxide or borate as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3409
Boron nitride starting material for making ceramics or secondary phase of a sintered ceramic	C04B 2235/386
Boron as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/421
Boron-containing organic compounds becoming part of a ceramic after heat treatment, e.g. borazine, borane or boranyl	C04B 2235/486

C04B 35/62295

{based on silicon nitride (C04B 35/589 takes precedence)}

Definition statement

This place covers:

The obtaining of ceramic fibers based on ceramics having as the largest fraction a silicon nitride phase, e.g. alpha- or beta-silicon nitride or silicon oxy- nitride such as SiAlON

References

Limiting references

This place does not cover:

Coating fibers with silicon nitride	C04B 35/62871

Informative references

Attention is drawn to the following places, which may be of interest for search:

Obtaining silicon nitride based ceramics in general	C04B 35/584 and subgroups
Silicon nitrides as starting material for making a ceramic or as secondary phase of a sintered ceramic, e.g. Si_3N_4, silicon carbonitride or silicon oxynitride (SiON)	C04B 2235/3873 and subgroups
Silicon as starting material for making a ceramic or as secondary phase of a sintered ceramic	C04B 2235/428
Si-containing organic compounds becoming part of a ceramic after heat treatment, e.g. silicone resins, (poly)silanes, (poly)siloxanes or (poly)silazanes	C04B 2235/483

C04B 35/624

Sol-gel processing

Definition statement

This place covers:

Processes in which a liquid containing inorganic sol particles is gelified.

References

Limiting references

This place does not cover:

Sol-gel processes for making a porous ceramic	C04B 38/0045 and subgroup
Gel casting of a ceramic slurry	C04B 2235/6023
Depositing a ceramic layer on a metallic substrate by sol-gel processing	C23C 18/1254

Informative references

Attention is drawn to the following places, which may be of interest for search:

Compositions of mortars, concrete or artificial stone, containing inorganic binders or the reaction product of an inorganic and an organic binder: sol-gel binders	C04B 28/005
Porous mortars, concrete, artificial stone or ceramic ware; preparation thereof by a process involving the formation of a sol or a gel, e.g. sol-gel or precipitation processes	C04B 38/0045 and subgroup
Coating or impregnating a ceramic substrate by the sol-gel process	C04B 41/4537

Inorganic membrane formation by sol-gel transition	B01D 67/0048, B01D 67/0048
Preparation of sols of inorganic materials in water in general	B01J 13/0008 and subgroups
Preparation of gels containing inorganic material and water	B01J 13/0056 and subgroup
Precipitating catalyst gels	B01J 37/036
Compositions of refractory mould or core materials; Grain structures thereof characterised by the use of binding agents; Mixtures of binding agents of inorganic agents N: sols, colloids or hydroxide gels]	B22C 1/181
Methods for preparing oxides or hydroxides in general by oxidation or hydrolysis of elements or compounds in the liquid or solid state or in non-aqueous solution, e.g. sol-gel process	C01B 13/32
Preparation of colloidal silica , e.g. sols, gels, dispersions and their after-treatments	C01B 33/14 and subgroups
Making glass by wet processes, e.g. sol-gel processes	C03C 2203/20 and subgroups, C03C 2214/32
Making coatings on glass by sol-gel processes	C03C 2218/113
Manufacture or treatment of semiconductor devices or of parts thereof: forming insulating materials on a substrate: liquid deposition, e.g. spin-coating, sol-gel techniques, spray coating]	H01L 21/02282, H01L 21/02282 and subgroups

C04B 35/626

Preparing or treating the powders individually or as batches {(pigments for ceramics C09C 1/0009); preparing or treating macroscopic reinforcing agents for ceramic products, e.g. fibres; mechanical aspects section B}

Definition statement

This place covers:

All processes for producing and treating ceramic powders or fibers, or powders or fibers that are used for making ceramics, where these powders or fibers subsequently are used to make shaped ceramics, e.g. coating ceramic particles, heat treating ceramic (precursor) particles. Coating ceramic fibers. Additives used for shaping ceramics, such as inorganic and organic binders.

References

Limiting references

This place does not cover:

Apparatus or methods for producing or processing clay suspensions, e.g. slip	B28C 1/02 and subgroups
Apparatus or methods for processing clay-containing substances in non-fluid condition	B28C 1/10 and subgroups
Apparatus or methods for mixing clay or ceramic with other substances	B28C 3/00
Controlling the operation of apparatus for producing mixtures of clay, ceramic or cement with other substances; Supplying or proportioning the ingredients for mixing clay or cement with other substances; Discharging the mixture	B28C 7/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Aspects relating to the preparation, properties or mechanical treatment of green bodies or pre-forms	C04B 2235/60 and subgroups
Pigments for ceramics	C09C 1/0009

Special rules of classification

C04B 35/626 and subgroups apply to powder and powder like materials, e.g. fibers whiskers, platelets, slurries, dispersions.

C04B 35/62605

{Treating the starting powders individually or as mixtures}

Definition statement

This place covers:

Processes for producing and treating ceramic powders or powders that are used for making ceramics, where these powders subsequently are used to make shaped ceramics, e.g. heat treating ceramic (precursor) particles, sieving ceramic powders

References

Limiting references

This place does not cover:

Supplying or proportioning the ingredients	B28C 7/04 and subgroups

C04B 35/6261

{Milling}

Definition statement

This place covers:

Milling treatments of powder particles such as ball milling or grinding, usually in order to reduce the particle size, normally in wet condition, but dry conditions can be used as well. Milling is the process by which materials are reduced from a large size to a smaller size. Milling may involve breaking up cemented material (in which case individual particles retain their shape) or pulverization (which involves grinding the particles themselves to a smaller size). Milling is generally done by mechanical means, including attrition (which is particle-to-particle collision that results in agglomerate break up or particle shearing), compression (which applies a forces that results in fracturing), and impact (which employs a milling medium or the particles themselves to cause fracturing). Attrition milling equipment includes the wet scrubber (also called the planetary mill or wet attrition mill), which has paddles in water creating vortexes in which the material collides and break up. Compression mills include the jaw crusher, roller crusher and cone crusher. Impact mills include the ball mill, which has media that tumble and fracture the material. Shaft impactors cause particle-to particle attrition and compression.

Relationships with other classification places

Crushing, pulverising or disintegrating in general B02C

References

Limiting references

This place does not cover:

Mechanical aspects of methods specially adapted for comminuting clay or ceramic in non-fluid condition	B28C 1/18 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Fillers added to cement, concrete, mortar or artificial stone: comminuting, e.g. by grinding or breaking; defibrillating fibres other than asbestos	C04B 20/026
Grinding catalysts	B01J 37/0036
Milling balls	B02C 17/20 and B02C 15/005
Crushing, grinding or milling of metallic powders	B22F 9/04
Producing suspensions, e.g. by blunging or mixing; with means for removing stones	B28C 1/04
Grinding, deagglomeration, disintegration of aluminium oxide; Aluminium hydroxide; Aluminates	C01F 7/023
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: grinding silicic acid	C09C 1/3018, C09C 1/3018
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: grinding titania	C09C 1/3623, C09C 1/3623
Treatment in general of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: grinding	C09C 3/041, C09C 3/041

C04B 35/62615

{High energy or reactive ball milling}

Definition statement

This place covers:

Milling with high energy in order to activate powders or to cause a chemical reaction leading to a different phase composition

C04B 35/6262

{of calcined, sintered clinker or ceramics}

Definition statement

This place covers:

A powder is calcined and then milled before it is either calcined again and/or used to make a ceramic. A green or sintered ceramic is destroyed by milling after which the resulting powder is calcined and/or used to make a ceramic,

C04B 35/62625

{Wet mixtures}

Definition statement

This place covers:

The making and treating of mixtures of a liquid and solids where the wet mixture is used to make a ceramic material, e.g. obtaining a slurry with a certain viscosity

References

Limiting references

This place does not cover:

Making a clay slurry	C04B 33/18
Apparatus or methods for producing or processing clay or ceramic suspensions, e.g. slip	B28C 1/02, B28C 1/02 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating a ceramic substrate with a emulsion, dispersion or suspension	C04B 41/4539
Feeding a slurry or a ceramic slip to moulds or apparatus for producing shaped articles	B28B 2013/0265 , B28B 2013/0265
Abrasive powders, suspensions and pastes for polishing	C09K 3/1454 and subgroups
Stabilised aqueous aluminosilicate suspensions for detergents	C11D 3/1286

C04B 35/6263

{characterised by their solids loadings, i.e. the percentage of solids}

Definition statement

This place covers:

Obtaining a slurry with a certain defined relation between the amount of solids and liquid is obtained, e.g. with 40-50 wt% solids or 20-30 vol% solids

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Using specific drying method to reduce the solids loading	C04B 35/62655

C04B 35/62635

{Mixing details}

Definition statement

This place covers:

Specific methods for mixing the solid and liquid components are used, e.g. a specific mixer is used, or a mixer is used with a specific rotation speed, ultra-sonification is used.

Relationships with other classification places

mixers in general B01F

proportioning in general G01F, G01G

References

Limiting references

This place does not cover:

Mixing solids and liquids by a milling technique, e.g. wet ball milling	C04B 35/6261 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

At least two separate mixing steps are used to add different components to the ceramic mixture	C04B 35/62685
Processes, in general, for influencing or modifying the properties of mortars, concrete or artificial stone composition: aspects relating to the mixing step of the mortar preparation	C04B 40/0028 with subgroups
Producing suspensions, e.g. by blunging or mixing; with means for removing stones	B28C 1/04, B28C 1/04
Apparatus or methods for mixing clay or ceramics with other substances	B28C 3/00, B28C 3/00 and subgroups
Apparatus or methods for producing mixtures of cement with other substances, e.g. slurries, mortars, porous or fibrous compositions	B28C 5/00, B28C 5/00 and subgroups
Controlling the operation of apparatus for producing mixtures of clay or cement with other substances; Supplying or proportioning the ingredients for mixing clay or cement with other substances; Discharging the mixture	B28C 7/00, B28C 7/00 and subgroups

C04B 35/6264

{Mixing media, e.g. organic solvents}

Definition statement

This place covers:

Using a specific liquid for a ceramic containing slurry or a slurry that is used for making a ceramic, e.g. water with a specific pH, a specific mixture of water with organic solvents, a specific mixture of organic solvents, using an unusual organic solvent

References

Limiting references

This place does not cover:

The use of organic solvents in coatings of ceramic substrates	C04B 41/463

C04B 35/62645

{Thermal treatment of powders or mixtures thereof other than sintering}

Definition statement

This place covers:

Thermal treatments of non-shaped ceramic or pre-ceramic powders or mixtures, such as calcining a ceramic powder mixture, pyrolysing an inorganic-organic pre-ceramic mixture, carbonising organic material into carbon or other non-oxide material, e.g. silicon carbide

References

Limiting references

This place does not cover:

Preheating, burning calcining or cooling of lime, magnesia or dolomite	C04B 2/10 and subgroups
Burning methods for clay wares	C04B 33/32 and subgroup
Curing of mixtures	C04B 35/6269

Informative references

Attention is drawn to the following places, which may be of interest for search:

Heat treatment, e.g. precalcining, burning, melting; Cooling of hydraulic cements	C04B 7/43 and subgroups
Methods and apparatus for] dehydrating gypsum	C04B 11/028 and subgroups
Fillers added to cement, concrete, mortar or artificial stone: thermal treatment	C04B 20/04 and subgroups
Burning or sintering processes for ceramics	C04B 35/64
Aspects relating to heat treatment of green bodies, e.g. burning, sintering or melting processes [N0808]	C04B 2235/65
Heat treatments such as] Calcining; Fusing Pyrolysis in general	B01J 6/00 and subgroups
Processing clay- or ceramic containing substances in non-fluid condition by heating, drying	B28C 1/227
Producing mixtures of clay or cement with other substances; Heating, e.g. using steam	B28C 7/003
Making magnesia by calcining magnesium hydroxide	C01F 5/08
Dehydration of aluminium oxide or hydroxide, by calcination	C01F 7/441 and subgroups
Drying; Calcining; After treatment of titanium oxide	C01G 23/08

Drying, calcination of silicic acid to enhance its pigmenting or filling properties	C09C 1/3027, C09C 1/3027,
Drying, calcination of titania to enhance its pigmenting or filling properties	C09C 1/363, C09C 1/363
Drying, calcination of inorganic materials in general, other than fibrous fillers, to enhance their pigmenting or filling properties	C09C 3/043, C09C 3/043
Methods of preparing the interference pigments by wet methods, e.g. co-precipitation comprising a drying or calcination step after applying each layer	C09C 2220/103
Methods of preparing the interference pigments by wet methods, e.g. co-precipitation comprising only a drying or calcination step of the finally coated pigment	C09C 2220/106
Shaft or like vertical or substantially vertical furnaces wherein no smelting of the charge occurs, e.g. calcining or sintering furnaces	F27B 1/005, F27B 1/005
Rotary-drum furnaces, i.e. horizontal or slightly inclined Arrangements of preheating devices for the charge	F27B 7/2016
Type of treatment of the charge: Calcining	F27M 2003/03

Special rules of classification

The class C04B 35/62645 is for instance given if the time of the heat treatment is of specific importance. If the specific temperature used is of significant importance, C04B 35/62675 is given.

C04B 35/6265

{involving reduction or oxidation}

Definition statement

This place covers:

Heating methods that result in the oxidation or reduction of powders, preparatory to the making of a ceramic material, e.g. reducing an oxide powder to a carbide powder in order to make a carbide ceramic, or oxidising a metallic powder to make an oxide ceramic

References

Limiting references

This place does not cover:

Directional oxidation or solidification, e.g. Lanxide process	C04B 35/652
Reduction treatment in general of a shaped ceramic	C04B 2235/652

Informative references

Attention is drawn to the following places, which may be of interest for search:

Oxidative annealing of shaped ceramics	C04B 2235/663
Reductive annealing of shaped ceramics	C04B 2235/664

C04B 35/62655

{Drying, e.g. freeze-drying, spray-drying, microwave or supercritical drying}

Definition statement

This place covers:

The drying of unshaped ceramic mixtures or mixtures that can be used to make a ceramic, e.g. ceramic slurries, dispersions, hydrated powder, where the liquid can be water or any organic solvent.

Relationships with other classification places

Spraying or atomising in general B05

Drying solid materials or objects by removing liquid therefrom F26B

References

Limiting references

This place does not cover:

Drying clay or porcelain powder mixtures	C04B 33/30
Curing of starting mixtures for making ceramics or of green bodies	C04B 35/6269
Drying of green ceramic or refractory bodies	C04B 2235/606

Informative references

Attention is drawn to the following places, which may be of interest for search:

Processes, in general, for influencing or modifying the properties of mortars, concrete or artificial stone composition: making use of electric or wave energy or particle radiation	C04B 40/0003 with subgroups
Processes, in general, for influencing or modifying the properties of mortars, concrete or artificial stone composition: freeze-drying	C04B 40/0078
Removal of physically bonded water from cement or ceramics, e.g. drying of hardened concrete	C04B 41/5307
Drying a catalyst slurry, e.g. spray drying	B01J 37/0045
Freeze drying, i.e. lyophilisation of catalysts	B01J 37/32
Spray drying of solutions or suspensions of metallic powders	B22F 9/026 or B22F 9/08 and subgroups
Mechanical aspects of drying clay objects	B28B 11/243
Processing clay- or ceramic containing substances in non-fluid condition by heating, drying	B28C 1/227
Surface treatment of glass not in the form of fibres or filaments: drying; dehydroxylation]	C03C 23/0085
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: drying silicic acid	C09C 1/3027, C09C 1/3027
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: drying titania	C09C 1/363, C09C 1/363
Treatment in general of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: drying	C09C 3/043, C09C 3/043

C04B 35/6266

{Humidity controlled drying}

Definition statement

This place covers:

All drying methods where the humidity of the atmosphere is quantified, e.g. drying in a chamber with 50% humidity

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Hardening mortars, concrete or artificial stone in an atmosphere of increased relative humidity	C04B 40/0281

C04B 35/62665

{Flame, plasma or melting treatment}

Definition statement

This place covers:

The making of ceramic powders that are used to make ceramic objects by a method in which the raw material is molten or by which the raw material is passed through a flame, e.g. oxygen flame methods

References

Limiting references

This place does not cover:

Melting, fusion or softening of clay materials	C04B 33/323
Magnesium oxide refractories from grain sized mixtures containing chromium oxide or chrome ore obtained from fused grains	C04B 35/0473
Melting of ceramic or refractory material to make a bulk ceramic	C04B 35/653 and subgroup

Informative references

Attention is drawn to the following places, which may be of interest for search:

Burning; Melting of hydraulic cements	C04B 7/44 and subgroups
Burning; Melting of hydraulic cements, using plasmas or radiations	C04B 7/4453
Melted agglomerated or melted waste materials or melted refuse as fillers for mortars, concrete or artificial stone	C04B 18/026
Ceramic products containing macroscopic reinforcing agents, e.g. fused silica	C04B 35/82
Processes, in general, for influencing or modifying the properties of mortars, concrete or artificial stone composition: involving melting of at least part of the composition	C04B 40/0085
Thermally activated mortars, e.g. by melting ingredients	C04B 40/0691

Plasma sintering	C04B 2235/666
Heat treatments such as; Fusing in general	B01J 6/005 and subgroup
Preparation of catalyst particles by melting	B01J 37/0081
Preparation of oxide powder in general by plasma method	C01B 13/28
Preparation of AlN powder by plasma method	C01B 21/0724, C01B 21/0724
Preparation of alumina powder by fusion or vaporisation	C01F 7/027
Treatment involving fusion or vaporisation of Aluminium oxide; Aluminium hydroxide; Aluminates	C01F 7/027
Preparation of alumina powder by plasma method	C01F 7/424
Melting temperature of inorganic powders	C01P 2006/34
Hot gas, e.g. plasma, flame, burner for drawing optical glass fibers	C03B 2205/68
Treatment in general of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: plasma treatment	C09C 3/048, C09C 3/048

C04B 35/6267

{Pyrolysis, carbonisation or auto-combustion reactions}

Definition statement

This place covers:

Making ceramic powder by pyrolysing or carbonising raw material, or by using an auto-combustion reaction, e.g. using a mixture of metal nitrates with urea and heating this mixture until the auto-combustion starts

References

Limiting references

This place does not cover:

Carbonisation of organic material into carbon powders	**C04B31/02** and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Porous mortars, concrete, artificial stone or ceramic ware obtained by a chemical conversion or reaction other than those relating to the setting or hardening of cement-like material or to the formation of a sol or a gel, e.g. by carbonising or pyrolysing preformed cellular materials based on polymers, organo-metallic or organo-silicon precursors	C04B 38/0022 and subgroups
Inorganic membrane formation by carbonisation or pyrolysis	B01D 67/0067, B01D 67/0067
Heat treatments such as Pyrolysis in general	B01J 6/008
Decomposition and pyrolysis for making catalysts	B01J 37/082, B01J 37/082 and subgroups
Making metal compounds by pyrolysis	B22F 9/30 and subgroup

Making BN by pyrolysis	C01B 21/0646
Making TiN, ZrN or HfN by pyrolysis	C01B 21/0766
Multi-step carbonising or coking processes	C10B 57/02
Electrodes made by methods involving thermal decomposition pyrolysis	H01M 4/0471

C04B 35/62675

{characterised by the treatment temperature}

Definition statement

This place covers:

The calcination of ceramic powders or ceramic fibers, where the used calcination temperature is of importance.

References

Limiting references

This place does not cover:

The sintering into a shaped ceramic at a certain specific temperature	C04B 2235/656

Informative references

Attention is drawn to the following places, which may be of interest for search:

Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: calcining silicic acid	C09C 1/3027, C09C 1/3027
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: calcining titania	C09C 1/363, C09C 1/363
Treatment in general of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: calcination	C09C 3/043, C09C 3/043

C04B 35/6268

{characterised by the applied pressure or type of atmosphere, e.g. in vacuum, hydrogen or a specific oxygen pressure}

Definition statement

This place covers:

If the atmosphere during the heat treatment is not 1 atmosphere, but higher or lower, or if a specific gas is used, such as hydrogen, water, carbon monoxide, carbon dioxide, or if an unexpected atmosphere is used, e.g. heat treating oxide material in nitrogen or argon or heat treating non-oxide material in air

References

Limiting references

This place does not cover:

Used atmosphere during sintering of a shaped ceramic or bulk melting treatment	C04B 2235/658 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Selection of the kiln atmosphere during Heat treatment, e.g. precalcining, burning, melting; Cooling of hydraulic cements	C04B 7/4476
Processes of utilising sub-atmospheric or super-atmospheric pressure to effect chemical or physical change of matter; Apparatus therefore	B01J

C04B 35/62685

{characterised by the order of addition of constituents or additives}

Definition statement

This place covers:

Not all components are mixed together at the same moment, first a first mixture is made, which then receives a treatment such as calcination and/or milling, and then other components are added, thus there are at least two separate mixing steps in which components are added

Relationships with other classification places

mixers in general B01F

proportioning in general G01F, G01G

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Mixing solids and liquids by a milling technique, e.g. wet ball milling	C04B 35/6261 and subgroups
Mixing components for ceramic mixtures in wet conditions general, e.g. with specific mixers	C04B 35/62635
Apparatus or methods for mixing clay or ceramics with other substances	B28C 3/00, B28C 3/00 and subgroups
Controlling the operation of apparatus for producing mixtures of clay or cement with other substances; Supplying or proportioning the ingredients for mixing clay or cement with other substances; Discharging the mixture	B28C 7/00, B28C 7/00 and subgroups

C04B 35/6269

{Curing of mixtures}

Definition statement

This place covers:

Powder mixtures or pressed powder mixtures containing polymers or pre-polymers are heat treated in order to cure/set/harden the polymers or pre-polymer.

References

Limiting references

This place does not cover:

Drying clay or porcelain powder mixtures or clay green bodies	C04B 33/30
Drying, e.g. freeze-drying, spray-drying, microwave or supercritical drying of powder mixtures, slurries	C04B 35/62655
Drying of green ceramic or refractory bodies	C04B 2235/606
Heat treatments on green ceramic bodies	C04B 2235/65 and subgroups
Mechanical aspects of curing ceramics	B28B 11/24, B28B 11/24 and subgroup

Informative references

Attention is drawn to the following places, which may be of interest for search:

Processes, in general, for influencing or modifying the properties of mortars, concrete or artificial stone compositions: selection of the hardening environment	C04B 40/02 and subgroups
Crosslinking, e.g. vulcanising, of macromolecules in general	C08J 3/24 and subgroups

C04B 35/62695

{Granulation or pelletising (devices for shaping artificial aggregates from ceramic mixtures B28B 1/004)}

Definition statement

This place covers:

The ceramic material is granulated for instance by spray-drying, or is pelletised by using for instance a drum pelletiser, or by pressing

References

Limiting references

This place does not cover:

Devices for shaping artificial aggregates from ceramic mixtures	B28B 1/004

Informative references

Attention is drawn to the following places, which may be of interest for search:

Dehydrating; Forming, e.g. granulating of hydraulic cements in general	C04B 7/40
Pelletizing of Calcium sulphate cements before starting the manufacture	C04B 11/268
Granular material as fillers, e.g. pigments, for mortars, concrete or artificial stone	C04B 14/02 and subgroups
Pelletizing flue dust	C04B 18/085
Processes or devices for granulating materials, e.g. fertilisers in general	B01J 2/00 and subgroups
Granulating catalysts	B01J 37/0063

Granulating metals	B22F 9/00 and subgroups
Mechanical aspects of working of plastics or substances in a plastic state to make granules	B29B 9/00 and subgroups
Granulation of active carbon	C01B 31/14
Granulation, agglomeration of Aluminium oxide; Aluminium hydroxide; Aluminates	C01F 7/025
Attrition-index or crushing strength of granulates	C01P 2006/21
Pelletisation or prereacting of powdered raw materials for making glass	C03C 1/026
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: agglomeration, granulation, pelleting silicic acid	C09C 1/3036, C09C 1/3036
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: agglomeration, granulation, pelleting titania	C09C 1/3638, C09C 1/3638
Treatment in general of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: agglomeration, granulation, pelleting	C09C 3/045, C09C 3/045

C04B 35/628

Coating the powders {or the macroscopic reinforcing agents}

Definition statement

This place covers:

Inorganic additives that are used for making ceramics are coated, for instance with organic surfactant

Relationships with other classification places

Spraying or atomising in general; applying liquids or other fluent materials to surfaces, in general **B05F**

References

Limiting references

This place does not cover:

Coating ceramic fibers	C04B 35/62844
Coating bulk ceramic objects	C04B 41/45 and subgroups
Coating or impregnating of particulate or fibrous ceramic material, that is not subsequently used in a ceramic material	C04B 41/4584, C04B 41/88

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating fillers added to cement, concrete, mortars or artificial stone	C04B 20/10 and subgroups
Constituents for ceramics and secondary phases of ceramics not being of a fibrous nature	C04B 2235/30 and subgroups
Coating metallic powders with an organic coating	B22F 1/0062

Special rules of classification

Organic coatings on inorganic powders are classified in C04B 35/628.

The particles that are coated are indicated with symbols from C04B 2235/30-C04B 2235/448.

C04B 35/62802

{Powder coating materials}

Definition statement

This place covers:

Non-fibrous inorganic additives that are used for making ceramics are coated, for instance with silicon or boron, e.g. diamond particles are coated with Si that is used to make SiC bonded diamond

References

Limiting references

This place does not cover:

Coating non-fibrous inorganic additives that are used for making ceramics with an organic layer	C04B 35/628

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating of granules in general	B01J 2/003 , B01J 2/006
Coating of catalyst particles	B01J 37/0221 and subgroup
Coating metallic powders per se	B22F 1/02 and subgroup
Coating; Grafting; Microencapsulation of active carbon	C01B 31/084
Coated silica sol particles	C01B 33/149
Coating or hydrophobisation of silica gel	C01B 33/159
Inorganic particles per se consisting of a mixture of two or more inorganic phases, one phase coated with the other	C01P 2004/84 and subgroups
Pigments exhibiting interference colours comprising a core coated with only one layer having a high or low refractive index	C09C 1/0021, C09C 1/0021
Pigments exhibiting interference colours comprising a stack of coating layers with alternating high and low refractive indices, wherein the first coating layer on the core surface has the high refractive index	C09C 1/0024, C09C 1/0024 and subgroups
Pigments exhibiting interference colours comprising a stack of coating layers with alternating low and high refractive indices, wherein the first coating layer on the core surface has the low refractive index	C09C 1/0051, C09C 1/0051 and subgroups
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: coating silicic acid	C09C 1/3054 , C09C 1/3054
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: coating titania	C09C 1/3661 , C09C 1/3054
Treatment in general of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: coating	C09C 3/063, C09C 3/063

Interference pigments characterized by the core material	C09C 2200/10 and subgroups
Interference pigments comprising a layer with a concentration gradient or a gradient of the refractive index	C09C 2200/20 and subgroups
Interference pigments comprising an outermost surface coating	C09C 2200/40 and subgroups
Interference pigments comprising a layer or a core consisting of or comprising discrete particles, e.g. nanometric or submicrometer-sized particles; Inorganic particles, e.g. oxides, nitrides or carbides	C09C 2200/505
Abrasive composite particles per se, e.g. coated particles	C09K 3/1436, C09K 3/1436 and subgroup

Special rules of classification

This class is used for inorganic coatings on inorganic particles, where this coating cannot be classified in any of the subgroups for oxide, non-oxide or metal coating.

C04B 35/62805

{Oxide ceramics}

Definition statement

This place covers:

Inorganic particles are coated with an oxide layer or with material that converts to an oxide layer upon heating, such as with a metal nitrate salt, a metal carbonate salt, a metal halide salt, a metal phosphate, or with organo-metallics such as metal acetate. The coating contains for the majority oxide material, but can also contain a minority of non-oxide material.

References

Limiting references

This place does not cover:

Coating inorganic fibers with an oxide layer	C04B 35/62847 and subgroups
Coating of bulk ceramic objects with an oxide coating	C04B 41/5025, C04B 41/5072 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Light-sensitive devices comprising an oxide semiconductor electrode comprising mixed oxides, e.g. ZnO covered TiO_2 particles	H01G 9/2036, H01G 9/2036

C04B 35/62807

{Silica or silicates}

Definition statement

This place covers:

Inorganic particles are coated with a layer that contains for the majority a silica or silicate phase or with material that converts for the majority to a silica or silicate phase upon heating, for instance alumino-silicates such as cordierite, mullite, spodumene, alkaline earth silicates such as forsterite, wollastonite

References

Limiting references

This place does not cover:

Coating inorganic fibers with a silica or silicate layer	C04B 35/62849
Coating of bulk ceramic objects with a silicate or silica coating	C04B 41/5024, C04B 41/5035
Coating of bulk ceramic objects with a clay or kaolin coating	C04B 41/5037

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating fillers added to cement, concrete, mortars or artificial stone with silicate	C04B 20/1074

C04B 35/6281

{Alkaline earth metal oxides}

Definition statement

This place covers:

Inorganic particles are coated with a layer that contains for the majority an alkaline earth oxide phase or with material that converts for the majority to an alkaline earth oxide phase upon heating, such as with an alkaline earth nitrate salt, an alkaline earth carbonate salt, an alkaline earth halide salt, or with organo-metallics such as an alkaline earth acetate.

References

Limiting references

This place does not cover:

Mixed oxide coatings on inorganic particles of alkaline earth oxides with copper oxide, e.g. cuprates	C04B 35/62805
Mixed oxide coatings on inorganic particles of alkaline earth oxides with zinc oxide and/or bismuth oxide, e.g. magnesium bismuthate	C04B 35/62805
Mixed oxide coatings on inorganic particles of alkaline earth oxides with tin oxide, e.g. magnesium stannate	C04B 35/62805
Mixed oxide coatings on inorganic particles of alkaline earth oxides with both alumina and silica, e.g. cordierite	C04B 35/6281

Mixed oxide coatings on inorganic particles of alkaline earth oxides with silica without alumina, e.g. forsterite (Mg_2SiO_4)	C04B 35/6281
Mixed oxide coatings on inorganic particles of alkaline earth oxides with silica without alumina, e.g. wollastonite ($CaSiO_4$)	C04B 35/6281
Mixed oxide coatings on inorganic particles of alkaline earth oxides with alumina, without silica, e.g. calcium aluminate	C04B 35/62813
Mixed oxide coatings on inorganic particles of alkaline earth oxides with alumina, without silica, e.g. magnesium aluminate, spinel	C04B 35/62813
Mixed oxide coatings on inorganic particles of alkaline earth oxides with chromium oxide, e.g. chromites	C04B 35/62818
Mixed oxide coatings on inorganic particles of alkaline earth oxides with vanadium oxide and/or niobium oxide and/or molybdenum oxide and/or tungsten oxide and/or tantalum oxide, e.g. magnesium tantalum niobate ($MgNb_{0.5}Ta_{0.5}O_3$)	C04B 35/62818
Mixed oxide coatings on inorganic particles of alkaline earth oxides with titanium oxides, such as magnesium titanate or calcium titanate	C04B 35/62821
Mixed oxide coatings on inorganic particles of alkaline earth oxides with zirconium oxide, e.g. magnesium zirconate, containing more Zr than Mg and Ca	C04B 35/62823
Mixed oxide coatings on inorganic particles of alkaline earth oxides with zirconium oxide and titanium oxide, e.g. calcium titanate zirconate ($CaTi_{0.5}Zr_{0.5}O_3$)	C04B 35/62823
Mixed oxide coatings on inorganic particles of alkaline earth oxides with iron oxides and possible other metal oxides, e.g. ferrites	C04B 35/62826
Coating inorganic fibers with an alkaline earth oxide layer	C04B 35/62847
Coating of bulk ceramic objects with a magnesia coating	C04B 41/5029

Special rules of classification

The alkaline earth oxide is not mixed with other metal oxides, except for alkali metal oxides or rare earth metal oxides. If the alkaline earth metal is mixed with other metal oxides, normally other materials such as alkaline earth metal titanates, aluminates, silicates, zirconates, niobates, chromates, ferrites, manganates, etc. are formed. These coatings are classified in the classes for these materials, e.g. alkaline earth aluminates in C04B 35/62813, alkaline earth titanate in C04B 35/62821, alkaline earth chromates and niobates in C04B 35/62818, alkaline earth zirconates in C04B 35/62823, alkaline earth ferrites in C04B 35/62826, alkaline earth silicates in C04B 35/62807, alkaline earth manganates, stannates C04B 35/62805. Mixtures of alkaline earth, alkali and rare earth oxide are classified according to which of these 3 groups is present in the largest amount, e.g. a coating containing 40 wt % alkaline earth oxide, 30 wt% alkali oxide and 30 wt% rare earth oxide is classified in C04B 35/6281.

C04B 35/62813

{Alumina or aluminates}

Definition statement

This place covers:

Inorganic particles are coated with a layer that contains for the majority an alumina or aluminate phase or with material that converts for the majority to an alumina or aluminate phase upon heating, such as with an aluminum nitrate salt, an aluminum carbonate salt, an aluminum halide salt, or with organo-metallics such as an aluminum acetate. The aluminate can for instance be a spinel, calcium aluminate, lanthanum aluminate, etc.

References

Limiting references

This place does not cover:

Alumino-silicate coating on inorganic particles	C04B 35/62807
Coating inorganic fibers with an alumina or aluminate layer	C04B 35/62852
Coating of bulk ceramic objects with an alumina or aluminate coating	C04B 41/5031 and subgroup
Coating of bulk ceramic objects with a spinel coating	C04B 41/5046

C04B 35/62815

{Rare earth metal oxides}

Definition statement

This place covers:

Inorganic particles are coated with a layer that contains for the majority a rare earth oxide phase or with material that converts for the majority to a rare earth oxide phase upon heating, such as with a rare earth nitrate salt, a rare earth carbonate salt, a rare earth halide salt, or with organo-metallics such as a rare earth acetate.

References

Limiting references

This place does not cover:

Mixed oxide coatings on inorganic particles of rare earth oxide with copper oxide, e.g. superconducting LaBa-cuprate	C04B 35/62805
Mixed oxide coatings on inorganic particles of rare earth oxide with zinc oxide and/or bismuth oxide, e.g. dysprosium bismuthate	C04B 35/62805
Mixed oxide coatings on inorganic particles of rare earth oxide with tin oxide, e.g. neodymium stannate	C04B 35/62805
Mixed oxide coatings on inorganic particles of rare earth oxide with silica without alumina	C04B 35/62807
Mixed oxide coatings on inorganic particles of rare earth oxide with both alumina and silica	C04B 35/62807
Mixed oxide coatings on inorganic particles of rare earth oxide with alumina, without silica, e.g. scandium aluminate	C04B 35/62813
Mixed oxide coatings on inorganic particles of rare earth oxide with chromium oxide, e.g. lanthanum chromites	C04B 35/62818
Mixed oxide coatings on inorganic particles of rare earth oxide with vanadium oxide and/or niobium oxide and/or molybdenum oxide and/ or tungsten oxide and/or tantalum oxide, e.g. erbium tantalum niobate ($ErNb_{0.5}Ta_{0.5}O_3$)	C04B 35/62818
Mixed oxide coatings on inorganic particles of rare earth oxide with titanium oxides, such as lanthanum titanate or cerium titanate	C04B 35/62821
Mixed oxide coatings on inorganic particles of rare earth oxide with zirconium oxide, e.g. cerium zirconate, containing more Zr than rare earth metals	C04B 35/62823

Mixed oxide coatings on inorganic particles of rare earth oxide with zirconium oxide and titanium oxide, e.g. ytterbium titanate zirconate ($YbTi_{0.5}Zr_{0.5}O_3$)	C04B 35/62823
Mixed oxide coatings on inorganic particles of rare earth oxide with iron oxides and possible other metal oxides, e.g. ferrites	C04B 35/62826
Coating inorganic fibers with a rare earth oxide layer	C04B 35/62847
Coating of bulk ceramic objects with a rare earth oxide coating	C04B 41/5045

Special rules of classification

The rare earth oxide is not mixed with other metal oxides, except for alkali metal oxides or rare earth metal oxides. If the rare earth metal is mixed with other metal oxides, normally other materials such as rare earth metal titanates, aluminates, silicates, zirconates, niobates, chromates, ferrites, manganates, etc. are formed. These coatings are classified in the classes for these materials, e.g. rare earth aluminates in C04B 35/62813, rare earth titanate in C04B 35/62821, rare earth chromates and niobates in C04B 35/62818, rare earth zirconates in C04B 35/62823, rare earth ferrites in C04B 35/62826, rare earth silicates in C04B 35/62807, rare earth manganates, stannates C04B 35/62805. Mixtures of alkaline earth, alkali and rare earth oxide are classified according to which of these 3 groups is present in the largest amount, e.g. a coating containing 30 wt% alkaline earth oxide, 30 wt% alkali oxide and 40 wt% rare earth oxide is classified in C04B 35/62815.

C04B 35/62818

{Refractory metal oxides}

Definition statement

This place covers:

Inorganic particles are coated with a layer that contains for the majority a refractory metal oxide phase or with material that converts for the majority to a refractory metal oxide phase upon heating, such as with refractory metal nitrate salt, refractory metal carbonate salt, refractory metal halide salt, or with organo-metallics such as refractory metal acetate. The refractory metal can for instance be chromium, vanadium, niobium, tungsten etc., the oxide phase can also be a mixed oxide such as a chromate, niobate, tungstate, vanadate.

References

Limiting references

This place does not cover:

Coating inorganic fibers with a refractory metal oxide layer	C04B 35/62855
Coating of bulk ceramic objects with a chromium oxide coating	C04B 41/5033
Coating of bulk ceramic objects with a niobium oxide or niobate coating	C04B 41/5051

C04B 35/62821

{Titanium oxide}

Definition statement

This place covers:

Inorganic particles are coated with a layer that contains for the majority a titania or titanate phase or with material that converts for the majority to a titania or titanate phase upon heating, such as with titanium nitrate salt, titanium carbonate salt, titanium halide salt, or with organo-metallics such

as titanium acetate. The titanates can be for instance calcium titanate, barium titanate, aluminium titanate, bismuth titanate, lead titanate, strontium titanate, sodium titanate, etc.

References

Limiting references

This place does not cover:

Titanate-zirconate coating on an inorganic particle	C04B 35/62818
Coating inorganic fibers with a titanium oxide or titanate layer	C04B 35/62855
Coating of bulk ceramic objects with a titanium oxide or titanate coating	C04B 41/5041

C04B 35/62823

{Zirconium or hafnium oxide}

Definition statement

This place covers:

Inorganic particles are coated with a layer that contains for the majority a zirconia or zirconate phase or with material that converts for the majority to a zirconia or zirconate phase upon heating, such as with zirconium nitrate salt, zirconium carbonate salt, zirconium halide salt, or with organo-metallics such as zirconium acetate. The zirconates can be for instance calcium zirconate, barium zirconate, bismuth zirconate, lead zirconate, strontium zirconate, sodium zirconate, or titanate-zirconates such as lead titanate zirconate (PZT), etc.

References

Limiting references

This place does not cover:

Coating inorganic fibers with a zirconium oxide or zirconate layer	C04B 35/62855
Coating of bulk ceramic objects with a zirconium oxide, hafnium oxide, zirconate or hafnate coating	C04B 41/5042 and subgroup

C04B 35/62826

{Iron group metal oxides}

Definition statement

This place covers:

Inorganic particles are coated with a layer that contains for the majority an iron oxide or ferrite phase or with material that converts for the majority to an iron oxide or ferrite phase upon heating, such as with ferric or ferrous nitrate salt, ferric or ferrous carbonate salt, ferric or ferrous halide salt, or with organo-metallics such as ferric or ferrous acetate. The ferrites can be for instance calcium ferrite, barium ferrite, bismuth ferrite, lead ferrite, strontium ferrite, sodium ferrite, Mn-Zn ferrite, etc.

References

Limiting references

This place does not cover:

Coating inorganic fibers with an iron group metal oxide layer	C04B 35/62847

Coating of bulk ceramic objects with a ferrite coating	C04B 41/5036

C04B 35/62828

{Non-oxide ceramics}

Definition statement

This place covers:

Inorganic particles are coated with a non-oxide layer, e.g. with a boride or silicide coating. The coating contains for the majority non-oxide material, but can also contain a minority of oxide material.

References

Limiting references

This place does not cover:

Coating inorganic fibers with a non-oxide ceramic layer	C04B 35/62857
Coating of bulk ceramic objects with a non-oxide coating	C04B 41/5072 and subgroups

C04B 35/62831

{Carbides}

Definition statement

This place covers:

Inorganic particles are coated with a carbide layer, e.g. with titanium carbide, boron carbide, tungsten carbide, zirconium carbide, oxy carbides. The coating contains for the majority carbide material, but can also contain a minority other material such as oxides, nitrides, borides.

References

Limiting references

This place does not cover:

Coating of particles with carbo-nitrides	C04B 35/62836
Coating inorganic fibers with a carbide layer	C04B 35/6286
Coating of bulk ceramic objects with a carbide coating	C04B 41/5057 and subgroups

C04B 35/62834

{Silicon carbide}

Definition statement

This place covers:

Inorganic particles are coated with a silicon carbide layer, e.g. with silicon oxy-carbide, with alpha silicon carbide, beta silicon carbide. The coating contains for the majority silicon carbide material, but can also contain a minority other material such as oxides, nitrides, borides.

References

Limiting references

This place does not cover:

Coating of particles with silicon carbo-nitrides	C04B 35/62836
Coating inorganic fibers with a silicon carbide layer	C04B 35/62863
Coating of bulk ceramic objects with a silicon carbide coating	C04B 41/5059

C04B 35/62836

{Nitrides}

Definition statement

This place covers:

Inorganic particles are coated with a nitride layer, e.g. with titanium nitride, boron nitride, tungsten nitride, zirconium nitride, aluminium nitride, silicon nitride, sialon, oxy nitrides in general, carbonitrides. The coating contains for the majority nitride material, but can also contain a minority other material such as oxides, carbides, borides.

References

Limiting references

This place does not cover:

Coating inorganic fibers with a nitride layer	C04B 35/62865 and subgroups
Coating of bulk ceramic objects with a nitride coating	C04B 41/5062, C04B 41/5063, C04B 41/5064, C04B 41/5066, C04B 41/5067, C04B 41/5068

C04B 35/62839

{Carbon}

Definition statement

This place covers:

Inorganic particles are coated with a carbon layer or carbon-like layer, e.g. with diamond, graphite, carbon black, pitch, tar, anthracene. The coating contains for the majority carbon material, but can also contain a minority other material such as oxides, carbides, borides, nitrides.

References

Limiting references

This place does not cover:

Coating of particles with carbides	C04B 35/62831 and subgroup
Coating inorganic fibers with a carbon layer	C04B 35/62873

Coating of bulk ceramic objects with carbon or carbonisable material coating	C04B 41/5001 and subgroups

C04B 35/62842

{Metals}

Definition statement

This place covers:

Inorganic particles to be used in making a ceramic are coated with a metal layer, e.g. with cobalt, nickel, iron, aluminium, titanium, silver, gold, platinum, palladium, chromium, copper. The coating contains for the majority metallic material, but can also contain a minority other material such as oxides, carbides, borides, nitrides, carbon.

References

Limiting references

This place does not cover:

Coating inorganic fibers with a metallic layer, to be used as reinforcement in ceramics	C04B 35/62876
Metalising bulk ceramic substrates, or metalising ceramic powders that are not used for making ceramics	C04B 41/51 and subgroups
Coating ceramic particles with a metallic layer, where the coated particles are subsequently used to make a cermet	C22C 29/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating fillers added to cement, concrete, mortars or artificial stone with metal	C04B 20/1062
Coating metallic powder with a metallic coating	B22F 1/025

Special rules of classification

In most cases coating ceramic particles with a metallic coating will not be usable to make a ceramic, but only for making a cermet, since the metal coating will easily form a metallic binder phase. In some cases, however, a metallic binder phase will not be formed, for instance if a ceramic coating layer is coated on top of the metallic coating layer and the ceramic coating encloses the metallic coating layer completely. The metallic coating layer might also react to a ceramic phase, e.g. to an oxide through oxidation, or to a carbide or nitride. In such a case the particle is usable for making a ceramic.

C04B 35/62844

{Coating fibres}

Definition statement

This place covers:

All ceramic fibers that are coated, whether they are used in a ceramic composite or for any other purpose; other fibers, e.g. glass or metallic fibers, that are used as additive for a ceramic composite that are coated; the coating can for instance be an organic surfactant

Relationships with other classification places

- Spraying or atomising in general; applying liquids or other fluent materials to surfaces, in general **B05F**

- Treating of textile materials by liquids, gases or vapours D06B

References

Limiting references

This place does not cover:

Making ceramic fibers	C04B 35/62227 and subgroups
Coating or impregnating of particulate or fibrous ceramic material, that is not subsequently used in a ceramic material	C04B 41/4584, C04B 41/88
Coating glass fibers that are not used to make ceramics	C03C 25/10 and subgroups
The coating of fibers that are used as additive to metallic alloys	C22C 47/04

Informative references

Attention is drawn to the following places, which may be of interest for search:

Fibrous materials and whiskers added to cement, concrete, mortar or artificial stone: composite fibres, e.g. fibres with a core and sheath of different material	C04B 20/0068
Coating or impregnating fillers added to cement, concrete, mortars or artificial stone: fillers characterised by the shape, e.g. fibrous materials	C04B 20/1014
Coating inorganic particles that are used for making ceramics	C04B 35/62802 and subgroups
Fibers used in ceramic composition	C04B 2235/5208 and subgroups
Chemical after-treatment of artificial filaments or the like of carbon during manufacture	D01F 11/10 and subgroups
Treating fibres, threads, yarns, fabrics, or fibrous goods made from such materials, with inorganic substances or complexes thereof	D06M 11/00 and subgroups

Special rules of classification

Organic coatings, e.g. a surfactant coating, on the fibers are classified in C04B 35/62844. The fiber that is coated is in principle indicated by symbols from the range C04B 2235/5208-C04B 2235/5248. If the synthesis or the composition of the fiber that is coated is of particular importance, a class from C04B 35/62227 and subgroups is given. In that case it is not necessary anymore to give a symbol from the range C04B 2235/5208-C04B 2235/5248 to indicate the fiber substrate that is coated.

C04B 35/62847

{with oxide ceramics}

Definition statement

This place covers:

Fibers are coated with an oxide layer. The coating contains for the majority oxide material, but can also contain a minority of non-oxide material.

References

Limiting references

This place does not cover:

Making oxide ceramic fibers	C04B 35/62231 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating inorganic particles used for making ceramics with an oxide layer	C04B 35/62805 and subgroups
Coating of bulk ceramic objects with an oxide coating	C04B 41/5025, C04B 41/5072 and subgroups
Chemical after-treatment of artificial filaments or the like of carbon during manufacture with oxides	D01F 11/123
Treating fibres, threads, yarns, fabrics, or fibrous goods made from such materials, with oxides, hydroxides or mixed oxides; with salts derived from anions with an amphoteric element-oxygen bond	D06M 11/36 and subgroups

C04B 35/62849

{Silica or silicates}

Definition statement

This place covers:

Fibers are coated with a layer that contains for the majority a silica or silicate phase, for instance alumino-silicates such as cordierite, mullite, spodumene, alkaline earth silicates such as forsterite, wollastonite

References

Limiting references

This place does not cover:

Making fibers based on silica	C04B 35/6224 and subgroup

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating fillers added to cement, concrete, mortars or artificial stone with silicate	C04B 20/1074
Making silica ceramics in general	C04B 35/14
Making silicate ceramics in general	C04B 35/16 and subgroups
Coating inorganic particles used for making ceramics with a silica or silicate layer	C04B 35/62807
Coating of bulk ceramic objects with a silicate or silica coating	C04B 41/5024, C04B 41/5035
Coating of bulk ceramic objects with a clay or kaolin coating	C04B 41/5037
Treating fibres, threads, yarns, fabrics, or fibrous goods made from such materials, with silicon dioxide, silicic acids or their salts	D06M 11/79

C04B 35/62852

{Alumina or aluminates}

Definition statement

This place covers:

Fibers are coated with a layer that contains for the majority an alumina or aluminate phase. The aluminate can for instance be a spinel, calcium aluminate, lanthanum aluminate, etc.

References

Limiting references

This place does not cover:

Making fibers based on alumina	C04B 35/62236
Alumino-silicate coating on inorganic fibers	C04B 35/62849

Informative references

Attention is drawn to the following places, which may be of interest for search:

Making alumina ceramics in general	C04B 35/10 and subgroups
Making aluminate ceramics in general	C04B 35/44 and subgroup
Coating inorganic particles used for making ceramics with an alumina or aluminate layer	C04B 35/62813
Coating of bulk ceramic objects with an alumina or aluminate coating	C04B 41/5031 and subgroup
Coating of bulk ceramic objects with a spinel coating	C04B 41/5046
Treating fibres, threads, yarns, fabrics, or fibrous goods made from such materials, with oxides or hydroxides of elements of the third Group of the Periodic System; Aluminates	D06M 11/45

C04B 35/62855

{Refractory metal oxides}

Definition statement

This place covers:

Fibers are coated with a layer that contains for the majority a refractory metal oxide phase. The refractory metal can for instance be chromium, vanadium, niobium, tungsten, titanium, zirconium etc., the oxide phase can also be a mixed oxide such as a chromate, niobate, tungstate, vanadate, titanate, zirconate, etc.

References

Limiting references

This place does not cover:

Making fibers based on zirconium oxide, e.g. zirconates such as PZT	C04B 35/6225
Making fibers based on titanium oxide	C04B 35/62259

Informative references

Attention is drawn to the following places, which may be of interest for search:

Making chromia based oxides in general	C04B 35/12
Making chromite based oxides in general	C04B 35/42
Making titania and titanate based oxides in general	C04B 35/46 and subgroups
Making zirconia and zirconate based oxides in general	C04B 35/48 and subgroups
Making ceramics based on the oxides of tantalum, niobium, tungsten, molybdenum and vanadium	C04B 35/495 and subgroups
Coating inorganic particles used for making ceramics with a refractory metal oxide layer	C04B 35/62855 and subgroups
Coating of bulk ceramic objects with a chromium oxide coating	C04B 41/5033
Coating of bulk ceramic objects with a titanium oxide or titanate coating	C04B 41/5041
Coating of bulk ceramic objects with a zirconium oxide, hafnium oxide, zirconate or hafnate coating	C04B 41/5042 and subgroup
Coating of bulk ceramic objects with a niobium oxide or niobate coating	C04B 41/5051
Treating fibres, threads, yarns, fabrics, or fibrous goods made from such materials, with oxides or hydroxides of elements of the fourth Group of the Periodic System; titanates; tirconates; stannates; plumbates	D06M 11/46
Treating fibres, threads, yarns, fabrics, or fibrous goods made from such materials, with oxides or hydroxides of elements of fifth Group of the Periodic System; vanadates; niobates; tantalates; arsenates: antimonates; bismuthates	D06M 11/47
Treating fibres, threads, yarns, fabrics, or fibrous goods made from such materials, with oxides of chromium, molybdenum or tungsten; chromates; dichromates; molybdates; tungstates	D06M 11/48

C04B 35/62857

{with non-oxide ceramics}

Definition statement

This place covers:

Fibers are coated with a non-oxide layer, e.g. with a nitride, carbide, boride or silicide coating. The coating contains for the majority non-oxide material, but can also contain a minority of oxide material.

References

Limiting references

This place does not cover:

Making fibers based on non-oxide ceramics	C04B 35/62272

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating inorganic particles used for ceramics with a non-oxide ceramic layer	C04B 35/62828 and subgroups
Coating of bulk ceramic objects with a non-oxide coating	C04B 41/5072 and subgroups
Chemical after-treatment of artificial filaments or the like of carbon during manufacture with boron, borides, boron nitrides	D01F 11/124
Treating fibres, threads, yarns, fabrics, or fibrous goods made from such materials, with sulphur, selenium, tellurium, polonium or compounds thereof	D06M 11/51 and subgroups
Treating fibres, threads, yarns, fabrics, or fibrous goods made from such materials, with boron or compounds thereof, e.g. borides	D06M 11/80

C04B 35/6286

{Carbides}

Definition statement

This place covers:

Fibers are coated with a carbide layer, e.g. with titanium carbide, boron carbide, tungsten carbide, zirconium carbide, oxy carbides. The coating contains for the majority carbide material, but can also contain a minority other material such as oxides, nitrides, borides.

References

Limiting references

This place does not cover:

Making fibers based on carbides	C04B 35/62277 and subgroup
Coating of fibers with carbo-nitrides	C04B 35/62865 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Making carbide ceramics in general	C04B 35/56 and subgroups
Coating inorganic particles used for making ceramics with a carbide layer	C04B 35/62831
Coating of bulk ceramic objects with a carbide coating	C04B 41/5057 and subgroups
Chemical after-treatment of artificial filaments or the like of carbon during manufacture with boron carbide	D01F 11/124
Chemical after-treatment of artificial filaments or the like of carbon during manufacture with carbides	D01F 11/126
Treating fibres, threads, yarns, fabrics, or fibrous goods made from such materials, with carbon or compounds thereof, e.g. with carbon or graphite; with carbides; with graphitic acids or their salts	D06M 11/74

C04B 35/62863

{Silicon carbide}

Definition statement

This place covers:

Fibers are coated with a silicon carbide layer, e.g. with silicon oxy-carbide, with alpha silicon carbide, beta silicon carbide. The coating contains for the majority silicon carbide material, but can also contain a minority other material such as oxides, nitrides, borides.

References

Limiting references

This place does not cover:

Making fibers based on silicon carbide	C04B 35/62281
Coating of fibers with silicon carbo-nitrides	C04B 35/62871

Informative references

Attention is drawn to the following places, which may be of interest for search:

Making silicon carbide ceramics in general	C04B 35/565 and subgroups
Coating inorganic particles used for making ceramics with a silicon carbide layer	C04B 35/62834
Coating of bulk ceramic objects with a silicon carbide coating	C04B 41/5059

C04B 35/62865

{Nitrides}

Definition statement

This place covers:

Fibers are coated with a nitride layer, e.g. with titanium nitride, tungsten nitride, zirconium nitride, aluminium nitride, oxy nitrides, carbonitrides. The coating contains for the majority nitride material, but can also contain a minority other material such as oxides, carbides, borides.

References

Limiting references

This place does not cover:

Making fibers based on nitrides	C04B 35/62286 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Making nitride ceramics in general	C04B 35/58 and subgroups
Coating inorganic particles used for making ceramics with a nitride layer	C04B 35/62836
Coating of bulk ceramic objects with a nitride coating	C04B 41/5062, C04B 41/5063, C04B 41/5064, C04B 41/5066, C04B 41/5067, C04B 41/5068
Chemical after-treatment of artificial filaments or the like of carbon during manufacture with nitrides, nitrogen carbides	D01F 11/128
Treating fibres, threads, yarns, fabrics, or fibrous goods made from such materials, with nitrogen or compounds thereof, e.g. with nitrides	D06M 11/58

C04B 35/62868

{Boron nitride}

Definition statement

This place covers:

Fibers are coated with a boron nitride layer, e.g. with hexagonal or cubic boron nitride, boron oxy nitride, boron carbonitride. The coating contains for the majority boron nitride material, but can also contain a minority other material such as oxides, carbides, borides.

References

Limiting references

This place does not cover:

Making fibers based on boron nitrides	C04B 35/6229

Informative references

Attention is drawn to the following places, which may be of interest for search:

Making boron nitride ceramics in general	C04B 35/583 and subgroup
Coating inorganic particles used for making ceramics with a nitride layer	C04B 35/62836
Coating of bulk ceramic objects with a boron nitride coating	C04B 41/5064
Chemical after-treatment of artificial filaments or the like of carbon during manufacture with boron, borides, boron nitrides	D01F 11/124

C04B 35/62871

{Silicon nitride}

Definition statement

This place covers:

Fibers are coated with a silicon nitride layer, e.g. with alpha or beta silicon nitride, silicon oxy nitride, sialon, silicon carbonitride, silicon oxy carbonitride. The coating contains for the majority silicon nitride material, but can also contain a minority other material such as oxides, carbides, borides.

References

Limiting references

This place does not cover:

Making fibers based on silicon nitrides	C04B 35/62295

Informative references

Attention is drawn to the following places, which may be of interest for search:

Making silicon nitride ceramics in general	C04B 35/584 and subgroups
Coating inorganic particles used for making ceramics with a nitride layer	C04B 35/62836
Coating of bulk ceramic objects with a silicon nitride coating	C04B 41/5066, C04B 41/5067 (sialon)
Chemical after-treatment of artificial filaments or the like of carbon during manufacture with boron, borides, boron nitrides	D01F 11/124

C04B 35/62873

{Carbon}

Definition statement

This place covers:

Fibers are coated with a carbon layer or carbon-like layer, e.g. with diamond, graphite, carbon black, pitch, tar, anthracene. The coating contains for the majority carbon material, but can also contain a minority other material such as oxides, carbides, borides, nitrides.

References

Limiting references

This place does not cover:

Coating of fibers with carbides	C04B 35/6286 and subgroup
The synthesis of carbon fibers	D01F 9/12, D10B 2101/12

Informative references

Attention is drawn to the following places, which may be of interest for search:

Making carbon based ceramics in general	C04B 35/52 and subgroups
Coating inorganic particles used for making ceramics with a carbon layer	C04B 35/62839
Coating of bulk ceramic objects with carbon or carbonisable material coating	C04B 41/5001 and subgroups
Surface treatment of fibres or filaments from glass, minerals, or slags by coating with carbon, e.g. graphite	C03C 25/44
Chemical after-treatment of artificial filaments or the like of carbon during manufacture with carbon	D01F 11/125
Treating fibres, threads, yarns, fabrics, or fibrous goods made from such materials, with carbon or compounds thereof, e.g. with carbon or graphite; with carbides; with graphitic acids or their salts	D06M 11/74

C04B 35/62876

{with metals}

Definition statement

This place covers:

Coating organic or inorganic fibers that are used for making ceramic objects with a metallic coating layer, e.g. with cobalt, nickel, iron, aluminium, titanium, silver, gold, platinum, palladium, chromium, copper. The coating contains for the majority metallic material, but can also contain a minority other material such as oxides, carbides, borides, nitrides, carbon.

References

Limiting references

This place does not cover:

Metalising fibers that are not used for making ceramics	C04B 41/51 and subgroups
Making metallic fibers	B22F 1/004

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating inorganic particles, used for making ceramics with a metallic layer	C04B 35/62842

Coating of bulk ceramic objects with a metallic coating	C04B 41/51 and subgroups
Chemical after-treatment of artificial filaments or the like of carbon during manufacture with metals	D01F 11/127, D01F 11/16 (by electrolysis)
Treating fibres, threads, yarns, fabrics, or fibrous goods made from such materials, with metals, with metal-generating compounds, e.g. metal carbonyls; Reduction of metal compounds on textiles	D06M 11/83

C04B 35/62878

{with boron or silicon}

Definition statement

This place covers:

The coating of fibers that are used in making ceramic objects with boron or silicon, e.g. coating a carbon fiber with silicon and reacting this fiber into a silicon carbide fiber, or coating a carbon fiber with boron and reacting this fiber into boron carbide

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating inorganic particles used for making ceramics with boron or silicon	C04B 35/62805
Coating of bulk ceramic objects with a boron coating	C04B 41/5094
Coating of bulk ceramic objects with a silicon coating	C04B 41/5096
Chemical after-treatment of artificial filaments or the like of carbon during manufacture with boron, borides, boron nitrides	D01F 11/124
Treating fibres, threads, yarns, fabrics, or fibrous goods made from such materials, with silicon, with halides or oxyhalides of silicon, with fluorosilicates	D06M 11/78
Treating fibres, threads, yarns, fabrics, or fibrous goods made from such materials, with boron, boron halides, fluoroborates	D06M 11/81

C04B 35/62881

{with metal salts, e.g. phosphates}

Definition statement

This place covers:

Inorganic particles are coated with a metal salt, such as with a metal nitrate salt, a metal carbonate salt, a metal halide salt, a metal phosphate, or with organo-metallics such as metal acetate. The metal salts are not converted into an oxide, carbide, nitride, boride phase, but remain as a metal salt on the fiber.

References

Limiting references

This place does not cover:

Making fibers based on metal phosphorus oxides, e.g. phosphates	C04B 35/62268
Coating inorganic fibers with a metal salt that is converted into an oxide layer	C04B 35/62847 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating of bulk ceramic objects with salts or salty compositions	C04B 41/5007 and subgroups
Coating of bulk ceramic objects with phosphates	C04B 41/5048
Treating fibres, threads, yarns, fabrics, or fibrous goods made from such materials, with halogens; with halogen acids or salts thereof; with oxides or oxyacids of halogens or salts thereof	D06M 11/07 and subgroups
Treating fibres, threads, yarns, fabrics, or fibrous goods made from such materials, with phosphorus or compounds thereof, e.g. with chlorophosphonic acid or salts thereof	D06M 11/68 and subgroups

C04B 35/62884

{by gas phase techniques}

Definition statement

This place covers:

The coating on the inorganic particles or on the fibers is applied by a gas phase technique, such as CVD (chemical vapour deposition), PVD (physical vapour deposition)

Relationships with other classification places

Making ceramic powders by gas phase techniques C01

References

Limiting references

This place does not cover:

Making ceramic fibers by gas phase techniques	C04B 35/62227 and subgroups
Reacting an inorganic powder or fiber with a gas, other than oxygen, to create a new phase, e.g. reacting an oxide powder or carbide fiber with ammonia to make a nitride powder or carbo-nitride fiber	C04B 2235/465
Coating metallic substrates by chemical coating by decomposition of gaseous compounds, without leaving reaction products of the surface material in the coating, e.g. chemical vapour deposition (CVD) processes	C23C 16/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating a bulk ceramic substrate applied from the gas phase	C04B 41/4529 and subgroups
Gas infiltration of green bodies or pre-forms	C04B 2235/614
PVD, CVD methods or coating in a gas-phase using a fluidized bed of preparing the interference pigments	C09C 2220/20

C04B 35/62886

{by wet chemical techniques}

Definition statement

This place covers:

The coating on the inorganic particles or on the fibers is applied by using a suspension or solution, e.g. by dipping the fibers in the liquid, or by dispersing the powder in a solution and filtering the powder of

Relationships with other classification places

Making ceramic powders by gas phase techniques C01

References

Limiting references

This place does not cover:

Making ceramic fibers by wet chemical techniques	C04B 35/62227 and subgroups
Chemically coating metallic substrates by decomposition of either liquid compounds or solutions	C23C 18/00 and subgroups
Chemically coating metallic substrates by decomposition of either solid compounds or suspensions	C23C 20/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating a ceramic substrate applied as a solution, emulsion, dispersion or suspension	C04B 41/4535 and subgroups
Liquid infiltration of green bodies or pre-forms	C04B 2235/616
Wet methods, e.g. co-precipitation of preparing the interference pigments	C09C 2220/10 and subgroups

C04B 35/62889

{with a discontinuous coating layer}

Definition statement

This place covers:

The applied coating layer does not cover the whole surface of the particles or fibers

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Partial coating of a bulk ceramic substrate	C04B 41/4572 and subgroups

C04B 35/62892

{with a coating layer consisting of particles}

Definition statement

This place covers:

The coating layer on the particles or fibers consists out of individual particles

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating a ceramic substrate applied as a solution, emulsion, dispersion or suspension	C04B 41/4539
Coating or impregnating a ceramic substrate with a powdery material	C04B 41/4545 and subgroups
Coatings of catalysts comprising impregnated particles	B01J 37/0248
Interference pigments comprising a layer or a core consisting of or comprising discrete particles, e.g. nanometric or submicrometer-sized particles	C09C 2200/50 and subgroups

C04B 35/62894

{with more than one coating layer}

Definition statement

This place covers:

Coating the inorganic particles or fibers with at least two coating layers. The coating layers can be of the same material or of different material.

References

Limiting references

This place does not cover:

Multiple coatings of bulk ceramic substrates or multiple coatings of powders or fibers that are not used to make ceramic materials	C04B 41/52 and subgroups, C04B 41/89 and subgroup

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating fillers added to cement, concrete, mortars or artificial stone with multiple coatings	C04B 20/12 and subgroup
Coatings of catalyst comprising several layer	B01J 37/0244

C04B 35/62897

{Coatings characterised by their thickness}

Definition statement

This place covers:

If the thickness of the coating layer on the inorganic particles or fibers is specified, this class is used.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Inorganic particles per se consisting of a mixture of two or more inorganic phases, one phase coated with the other: thin layer coatings, i.e. the coating thickness being less than 0.1 time the particle radius	C01P 2004/86
Inorganic particles per se consisting of a mixture of two or more inorganic phases, one phase coated with the other: thick layer coatings	C01P 2004/88
Interference pigments characterised by the thickness of the core or layers thereon or by the total thickness of the final pigment particle	C09C 2200/30 and subgroups

C04B 35/63

using additives specially adapted for forming the products, {e.g.. binder binders}

Definition statement

This place covers:

The addition of additives that have a function in the shaping of the ceramic product, e.g. binders, plasticizers, lubricants, surfactants, seeds

References

Limiting references

This place does not cover:

Additives that are added to the ceramic material to create porosity after a heat treatment	C04B 38/06 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Binders for clay products	C04B 33/1315
Addition of a binding agent for catalysts or of material, later completely removed a.o. as result of heat treatment, leaching or washing	B01J 37/0018
Binders for refractory moulds	B22C 1/16 and subgroups

Special rules of classification

Additional symbols (CCA) from the C04B 2235/00-scheme can be used to further specify the additive.

C04B 35/6303

{Inorganic additives}

Definition statement

This place covers:

All inorganic additives that are added for influencing the shaping of the ceramic product, in praxis inorganic binders

References

Limiting references

This place does not cover:

Inorganic additives for clay products	C04B 33/131
Oxide ceramics having a carbon binder	C04B 35/013

Informative references

Attention is drawn to the following places, which may be of interest for search:

Compositions of mortars, concrete or artificial stone, containing inorganic binders or the reaction product of an inorganic and an organic binder	C04B 28/00 and subgroups
Inorganic binders for refractory moulds	B22C 1/18 and subgroups

Special rules of classification

Additional symbols (CCA) from the C04B 2235/00-scheme can be used to further specify the inorganic additive.

C04B 35/6306

{Binders based on phosphoric acids or phosphates}

Definition statement

This place covers:

Phosphoric acid or phosphates are added to ceramic mixtures specifically with the function as binder

References

Limiting references

This place does not cover:

Ceramics based on phosphate material	C04B 35/447
Adding phosphoric acid or phosphates for other purposes	C04B 2235/447

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as active ingredients for mortars, concrete or artificial stone, e.g. accelerators: containing phosphorus in the anion, e.g. phosphates	C04B 22/16 and subgroup
Compositions of mortars, concrete or artificial stone, containing inorganic binders or the reaction product of an inorganic and an organic binder: containing cold phosphate binders	C04B 28/34 and subgroups
Inorganic additives for clay products	C04B 33/131
Inorganic phosphate binders for refractory moulds	B22C 1/185
Preparation of phosphates per se, e.g. phosphates powder, not preparative to making a phosphates ceramic	C01B 25/26 and subgroups

Special rules of classification

This class can also be added in the case C04B 33/131 is given (inorganic additives for clay materials). No additional symbol (CCA) from the C04B 2235/00-scheme need to be used here.

If the phosphate binder phase forms the largest fraction of the ceramic, C04B 35/447 is used, rather than C04B 35/6306 or one of its subgroups.

C04B 35/6309

{Aluminium phosphates}

Definition statement

This place covers:

The use of aluminium phosphate as binder for ceramic material

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Alumina additives	C04B 2235/3217 and subgroups
Preparation of aluminium phosphates per se, e.g. aluminium phosphates powder, not preparative to making an aluminium phosphate ceramic	C01B 25/36

Special rules of classification

This class can also be added in the case C04B 33/131 is given (inorganic additives for clay materials). No additional symbol (CCA) from the C04B 2235/00-scheme need to be used here.

C04B 35/6313

{Alkali metal or alkaline earth metal phosphates}

Definition statement

This place covers:

The use of alkali metal or alkaline earth metal phosphates as binder for ceramic material

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Alkali oxides as additives for making ceramics or as secondary phase	C04B 2235/3201 and subgroup
Alkaline earth oxides as additives for making ceramics or as secondary phase	C04B 2235/3205 and subgroups
Preparation of alkali metal phosphates per se, e.g. alkali metal phosphates powder, not preparative to making an alkali metal phosphate ceramic	C01B 25/30 and subgroups
Preparation of alkaline earth metal phosphates per se, e.g. alkaline earth metal phosphates powder, not preparative to making an alkaline earth metal phosphate ceramic	C01B 25/32 and subgroups

Special rules of classification

This class can also be added in the case C04B 33/131 is given (inorganic additives for clay materials). The specific alkali metal or alkaline earth ions are indicated with additional symbols (CCA) from the C04B 2235/00-scheme.

C04B 35/6316

{Binders based on silicon compounds}

Definition statement

This place covers:

Silicon compounds such as silica, silicates such as waterglass or clays, glass, silicon carbide (e.g. for diamond), silicon nitride, silicides, are used as binder for ceramic materials

References

Limiting references

This place does not cover:

Ceramics based on silica	C04B 35/14
Ceramics based on silicates	C04B 35/16 and subgroups
Ceramics based on zircon (zirconium silicate)	C04B 35/481
Ceramics based on silicon carbide	C04B 35/565 and subgroups
Ceramics based on silicides	C04B 35/58085 and subgroup
Ceramics based on silicon nitride	C04B 35/584 and subgroups
Ceramics based on sialon	C04B 35/597

Informative references

Attention is drawn to the following places, which may be of interest for search:

Alkali metal or ammonium silicate cements Alkyl silicate cements ; silica sol cements; soluble silicate cements	C04B 12/04
Compositions of mortars, concrete or artificial stone, containing inorganic binders or the reaction product of an inorganic and an organic binder: containing mixtures of the silica-lime type	C04B 28/18 and subgroups
Compositions of mortars, concrete or artificial stone, containing inorganic binders or the reaction product of an inorganic and an organic binder: containing alkyl, ammonium or metal silicates; containing silica sols	C04B 28/24 and subgroup
Inorganic additives for clay products	C04B 33/131
Ceramics based on zirconia, containing a silica binder	C04B 35/481
Silica as starting material for making a ceramic or as secondary phase of a sintered ceramic	C04B 2235/3418
Silicates other than clay as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. water glass (Na_2SiO_3)	C04B 2235/3427 and subgroups
Clays as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. bentonites/smectites such as montmorillonite, kaolines such as halloysite, illite, talc, sepiolite and attapulgite, vermiculite	C04B 2235/349
Glass starting materials for making ceramics, e.g. silica glass	C04B 2235/36 and subgroup
Silicon carbides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. SiC or SiOC	C04B 2235/3826 and subgroups
Silicon nitrides as starting material for making a ceramic or as secondary phase of a sintered ceramic, e.g. Si_3N_4, silicon carbonitride or silicon oxynitride (SiON)	C04B 2235/3873 and subgroups
Silicides as starting material for making a ceramic or as secondary phase of a sintered ceramic, i.e. chemical compounds between silicon and a one or more metals, e.g. chromium silicide ($CrSi_2$), molybdenum disilicide ($MoSi_2$), iron silicide (FeSi, $FeSi_2$), cobalt silicide (Co_2Si, CoSi, $CoSi_2$)	C04B 2235/3891

Silicon as starting material for making a ceramic or as secondary phase of a sintered ceramic	C04B 2235/428
Inorganic silica or silicate binders for refractory moulds	B22C 1/186 and subgroup
Preparation of silica powders, sols, gels, dispersions and their after-treatments	C01B 33/113 and subgroups
Preparation of silicate powders, sols, gels, dispersions and their after-treatments	C01B 33/20 and subgroups

Special rules of classification

This class can also be added in the case C04B 33/131 is given (inorganic additives for clay materials). Additional symbols (CCA) from the C04B 2235/00-scheme normally need to be added as well, e.g. in the case of a silica binder: C04B 35/6316 and C04B 2235/3418. In the case of a silicon nitride binder, possibly formed in situ: C04B 35/6316 and C04B 2235/3873.

If the silicon compound binder phase forms the largest fraction of the ceramic, the respective class for the silicon binder compound is used, e.g. a silica binder that forms the largest fraction, then C04B 35/14 is used, rather than C04B 35/6316.

C04B 35/632

Organic additives

Definition statement

This place covers:

Organic additives such as binders, lubricants, flocculating agents, defoaming agents, dispersants, coupling agents, surfactants, photoinitiators, organics that are pyrolysed to form a ceramic material, the organic part becoming part of the ceramic

References

Limiting references

This place does not cover:

Organic additives for clay products	C04B 33/1305
Using organic waste materials that become part of the ceramic, e.g. wood that is carbonised or rice bran	C04B 35/62204 and subgroups
The use of organic materials in coatings of ceramic substrates	C04B 41/46 and subgroups, C04B 41/82
The addition of organic fibers	C04B 2235/5212

Informative references

Attention is drawn to the following places, which may be of interest for search:

Organics added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/00 and subgroups
Impregnating a porous carbon product with organic material that is carbonised into carbon	C04B 35/521
Carbon products obtained from carbonaceous particles with a carbonisable binder	C04B 35/532

Metal organic salts used as starting materials for making ceramic	C04B 2235/44 and subgroups
Organics compounds becoming part of a ceramic after heat-treatment	C04B 2235/48 and subgroups
Organic binders for refractory moulds	B22C 1/20 and subgroups
Organic additives used for shaping metallic powder	B22F 1/0059 and subgroups

Special rules of classification

In the case (metal)-organic additives are pyrolysed to form a ceramic material and the organic part becomes part of the ceramic, e.g. as carbon, boride, nitride or carbide, the (metal)-organic additives are classified with symbol from C04B 2235/48, and possibly also with EC classes from C04B 35/63404-C04B 35/6365, if this information is not already present in the main EC-class given, e.g. C04B 35/524 (carbon), C04B 35/571 (SiC), C04B 35/589 (Si_3N_4)

C04B 35/6325

{based on organo-metallic compounds}

Definition statement

This place covers:

Organo-metallics used as additives for making ceramics, where the organic part is not an acid or alkoxide, e.g. an acetyl-acetonate

References

Limiting references

This place does not cover:

Metal-organic compounds used in coatings of ceramic substrates	C04B 41/49 and subgroups, C04B 41/84
Metal alkoxides used as additive for making ceramics	C04B 2235/441
Metal organic acids used as additive for making ceramics	C04B 2235/449

Informative references

Attention is drawn to the following places, which may be of interest for search:

Organometallics added as filler to cement, concrete, mortar or artificial stone	C04B 20/1051
Organometallics added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/40 and subgroups, C04B 26/30 and subgroup
Coating bulk ceramics with an organic or organo-metallic precursor of an inorganic material	C04B 41/4554
Metal organic salts used as starting materials for making ceramic materials	C04B 2235/44 and subgroups
Catalysts containing organo-metallic compounds or metal hydrides	B01J 31/12 and subgroups

Binders for refractory mould or core materials based on organic silicon or metal compounds, other organometallic compounds	B22C 1/205

C04B 35/634

Polymers (C04B 35/636 takes precedence)

Definition statement

This place covers:

Polymers that are used as additives in making ceramics, for instance binders that are burned away or polymers that are carbonised and become part of the ceramics.

Relationships with other classification places

Organic macromolecular compounds; their preparation or chemical working-up; compositions based thereon C08

References

Limiting references

This place does not cover:

Silicon carbide made from silicon containing polymers or pre-polymers	C04B 35/571
Silicon nitride made from silicon containing polymers or pre-polymers	C04B 35/589
Using polysaccharide or derivatives thereof as additive for making ceramics	C04B 35/636 and subgroup
Macromolecular compounds that are added to the ceramic material to create porosity after a heat treatment	C04B 38/067
The use of polymers in coatings of ceramic substrates	C04B 41/48 and subgroups, C04B 41/83

Informative references

Attention is drawn to the following places, which may be of interest for search:

Treatment of macromolecular material specially adapted to enhance its filling properties in mortars, concrete or artificial stone	C04B 16/04, C04B 18/20, C04B 20/00;
Polymers added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/24 and subgroups
Carbon ceramic obtained from polymer precursors	C04B 35/524
Polymers are carbonised and become part of the ceramics	C04B 2235/48

Special rules of classification

Polymers that are carbonised and become part of the ceramic product can be indicated by one of the subgroups of C04B 35/634, in combination with either C04B 2235/48 or a class such as C04B 35/524 that indicates that carbonisation takes place.

C04B 35/63404

{obtained by reactions only involving carbon-to-carbon unsaturated bonds}

Definition statement

This place covers:

Polymerisation only by polymerising C=C bonds

Relationships with other classification places

Macromolecular compounds obtained by reactions only involving carbon-to-carbon unsaturated bonds C08F

References

Limiting references

This place does not cover:

The use of other macromolecular compounds obtained by reactions only involving carbon-to-carbon unsaturated bonds in coatings of ceramic substrates	C04B 41/4857 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Polymers obtained by reactions only involving carbon-to-carbon unsaturated bonds added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/26 and subgroups, C04B 26/04 and subgroups
Binders for refractory mould or core materials based on resins or rosins obtained by reactions only involving carbon-to-carbon unsaturated bonds	B22C 1/2206

C04B 35/63408

{Polyalkenes}

Definition statement

This place covers:

Polymerisation of (R1)(R2)-C=C-(R3)(R4), where R are alkyl groups or hydrogen atoms

References

Limiting references

This place does not cover:

The use of polyalkenes in coatings of ceramic substrates	C04B 41/4861

Informative references

Attention is drawn to the following places, which may be of interest for search:

Polyalkenes added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/2611, C04B 26/045

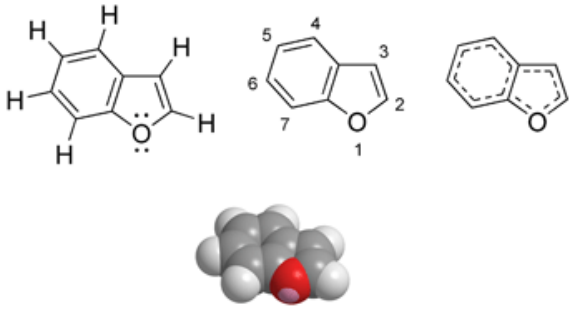
Binders for refractory mould or core materials based on resins or rosins obtained by reactions only involving carbon-to-carbon unsaturated bonds: polyalkenes	B22C 1/2213

C04B 35/63412

{Coumarone polymers}

Definition statement

This place covers:



Polymerised benzofuran (coumarone)

References

Limiting references

This place does not cover:

The use of coumarone polymers in coatings of ceramic substrates	C04B 41/4865

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coumarone polymers added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/2617
Coumarone-indene polymers	C08F 244/00 and subgroups, C08L 45/02, C09D 145/02, C09J 145/02, C08L 45/02, C09K 2200/064

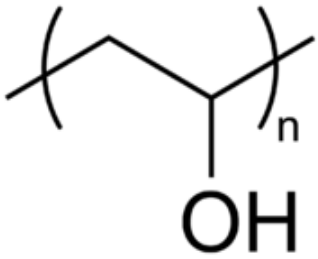
C04B 35/63416

{Polyvinylalcohols [PVA]; Polyvinylacetates}

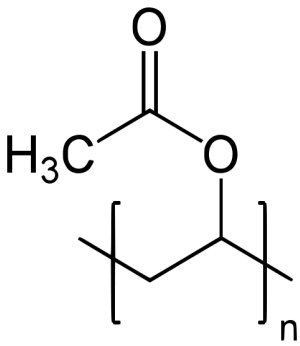
Definition statement

This place covers:

Polyvinylalcohol



Polyvinylacetate



References

Limiting references

This place does not cover:

The use of polyvinylalcohols, polyvinylacetates in coatings of ceramic substrates	C04B 41/4869

Informative references

Attention is drawn to the following places, which may be of interest for search:

Polyvinylalcohols or polyvinylacetates added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/2623 and subgroup
Polyvinyl alcohol	C08F 16/06, C08F 116/06, C08F 216/06, C08L 29/04, C09D 129/04, C09J 129/04

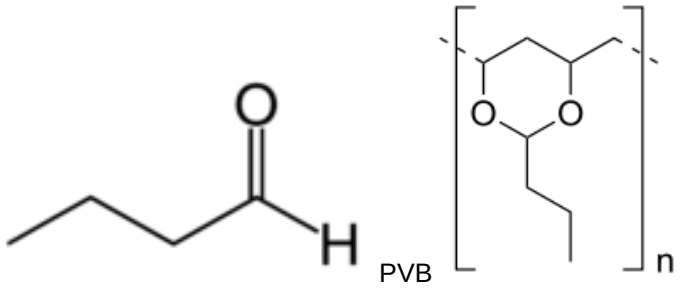
C04B 35/6342

{Polyvinylacetals, e.g. polyvinylbutyral [PVB]}

Definition statement

This place covers:

Polyvinylbutyral is prepared from polyvinyl alcohol by reaction with butyraldehyde



References

Limiting references

This place does not cover:

The use of polyvinylacetals in coatings of ceramic substrates	C04B 41/4873

Informative references

Attention is drawn to the following places, which may be of interest for search:

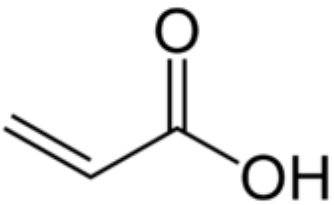
Polyvinylacetals added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/2635
Polyvinylacetals	C08L 29/14, C08L 59/00

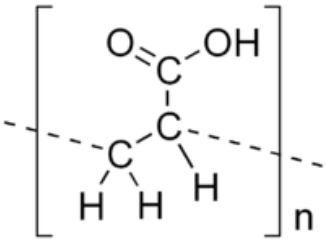
C04B 35/63424

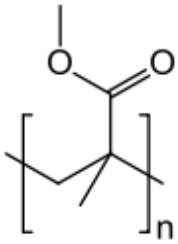
{Polyacrylates; Polymethacrylates}

Definition statement

This place covers:

Acrylic acid 

Polyacrylic acid 

Poly(methylmethacrylate) 

Methacrylates (CH_2=CMeCOO-) are the salts or esters of methacrylic acid

References

Limiting references

This place does not cover:

The use of polyacrylates in coatings of ceramic substrates	C04B 41/483

Informative references

Attention is drawn to the following places, which may be of interest for search:

Polyacrylates or polymethacrylates added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/2641 and subgroup, C04B 26/06
Binders for refractory mould or core materials based on resins or rosins obtained by reactions only involving carbon-to-carbon unsaturated bonds: polyacrylates	B22C 1/222

C04B 35/63428

{of ethylenically unsaturated dicarboxylic acid anhydride polymers, e.g. maleic anhydride copolymers}

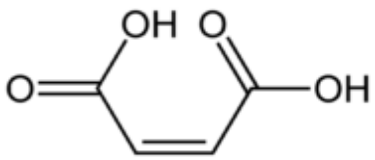
Definition statement

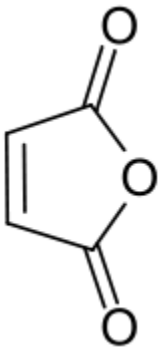
This place covers:

Polymers obtained by reactions only involving carbon-to carbon unsaturated bonds of ethylenically unsaturated dicarboxylic acid anhydre polymers, that are used as additives in making ceramics.

e.g.

Maleic acid is a dicarboxylic acid





Maleic anhydride is hydrolysed maleic acid

The C=C double bond can be used for polymerisation

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Polymers of ethylenically unsaturated dicarboxylic acid polymers, e.g. maleic anhydride copolymers, added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/2664 and subgroup

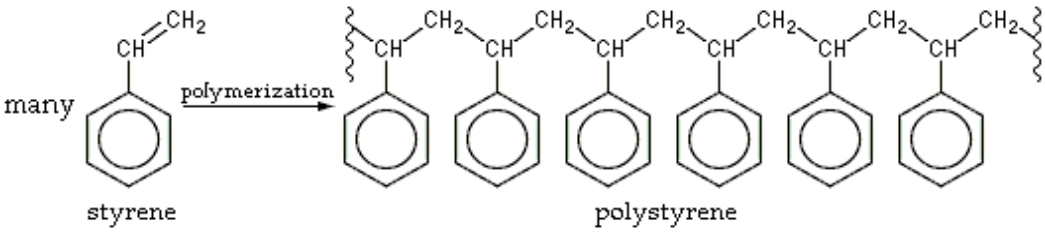
C04B 35/63432

{Polystyrenes}

Definition statement

This place covers:

Polystyrene is poly(1-phenylethene-1,2-diyl)) also known as Thermocole. The only commercially important form of polystyrene is atactic, which means that the phenyl groups are randomly distributed on both sides of the polymer chain.



References

Limiting references

This place does not cover:

The use of polystyrenes in coatings of ceramic substrates	C04B 41/4876

Informative references

Attention is drawn to the following places, which may be of interest for search:

Polystyrenes added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/2676
Polystyrene	C08L 25/06, C09D 125/06, C09J 125/06

C04B 35/63436

{Halogen-containing polymers, e.g. PVC}

Definition statement

This place covers:

Polymers obtained by reactions only involving carbon-to-carbon unsaturated bonds and containing halogen, that are used as additives in making ceramics.

e.g.

Poly(chloroethanediyl), or PVC

References

Limiting references

This place does not cover:

The use of halogenated polymers in coatings of ceramic substrates	C04B 41/4838 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Halogen containing polymers, e.g. PVC, added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/2682, C04B 26/08
Binders for refractory mould or core materials based on resins or rosins obtained by reactions only involving carbon-to-carbon unsaturated bonds: halogen-containing polymers	B22C 1/2226

C04B 35/6344

{Copolymers containing at least three different monomers}

Definition statement

This place covers:

A heteropolymer or copolymer is a polymer derived from three (or more) monomeric species, as opposed to a homopolymer where only one monomer is used

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Copolymers containing at least three different monomers added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/2688 and subgroup

C04B 35/63444

{Nitrogen-containing polymers, e.g. polyacrylamides, polyacrylonitriles, polyvinylpyrrolidone [PVP], polyethylenimine [PEI]}

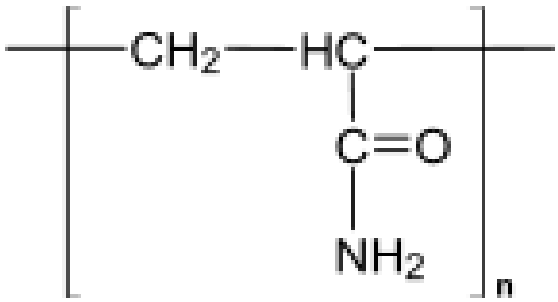
Definition statement

This place covers:

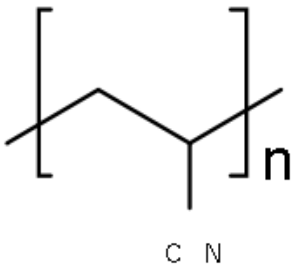
Polymers obtained by reactions only involving carbon-to-carbon unsaturated bonds and containing nitrogen, that are used as additives in making ceramics.

e.g.

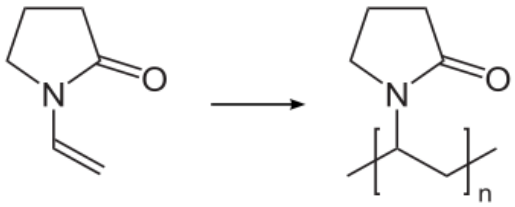
Polyacrylamide



Polyacrylonitrile (PAN)



Polyvinylpyrrolidone (PVP),



polyethyleneimines (PEIs

References

Limiting references

This place does not cover:

The use of polyacrylamides in coatings of ceramic substrates	C04B 41/4834

Informative references

Attention is drawn to the following places, which may be of interest for search:

Nitrogen containing polymers, e.g. polyacrylamides, polyacrylonitriles added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/2652 and subgroup
Polyalkylene polyamines; polyethylenimines; Derivatives thereof	C08G 18/6423

C04B 35/63448

{obtained otherwise than by reactions only involving carbon-to-carbon unsaturated bonds}

Definition statement

This place covers:

Obtained by polymerising C=N or C=O bonds, possibly also C=C bonds

Relationships with other classification places

Macromolecular compounds obtained otherwise than by reactions only involving unsaturated carbon-to-carbon bonds C08G

References

Limiting references

This place does not cover:

The use of other macromolecular compounds obtained otherwise than by reactions only involving carbon-to-carbon unsaturated bonds in coatings of ceramic substrates	C04B 41/488 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Polymers obtained otherwise than by reactions only involving carbon-to-carbon unsaturated bonds added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/28 and subgroups, C04B 26/10
Binders for refractory mould or core materials based on resins or rosins obtained otherwise than by reactions only involving carbon-to-carbon unsaturated bonds	B22C 1/2233

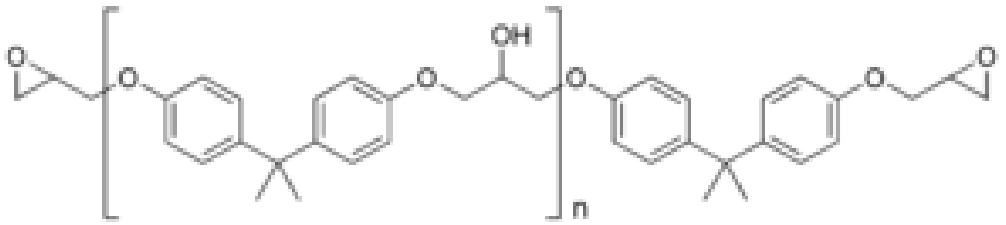
C04B 35/63452

{Polyepoxides}

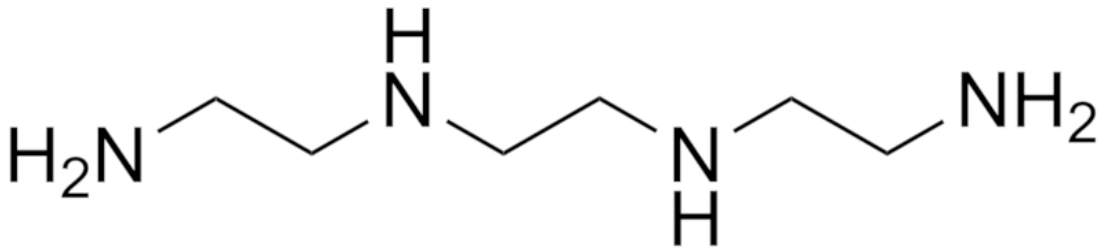
Definition statement

This place covers:

Epoxy is a copolymer; that is, it is formed from two different chemicals. These are referred to as the "resin" or "compound" and the "hardener" or "activator". The resin consists of monomers or short chain polymers with an epoxide group at either end. Most common epoxy resins are produced from a reaction between epichlorohydrin and bisphenol-A, though the latter may be replaced by similar chemicals. The hardener consists of polyamine monomers, for example Triethylenetetramine (TETA). When these compounds are mixed together, the amine groups react with the epoxide groups to form a covalent bond. Each NH group can react with an epoxide group, so that the resulting polymer is heavily crosslinked, and is thus rigid and strong



Structure of unmodified epoxy prepolymer resin. n denotes the number of polymerized subunits and is in the range from 0 to about 25



Structure of TETA, a typical hardener. The amine (NH) groups react with the epoxide groups of the resin during polymerization

References

Limiting references

This place does not cover:

The use of polyepoxides in coatings of ceramic substrates	C04B 41/4853

Informative references

Attention is drawn to the following places, which may be of interest for search:

Polyepoxides added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/281, C04B 26/14
Binders for refractory mould or core materials based on resins or rosins obtained otherwise than by reactions only involving carbon-to-carbon unsaturated bonds: polyepoxides	B22C 1/226

Polyepoxides	C09D 5/443, C09K 19/388, C09K 2200/0647

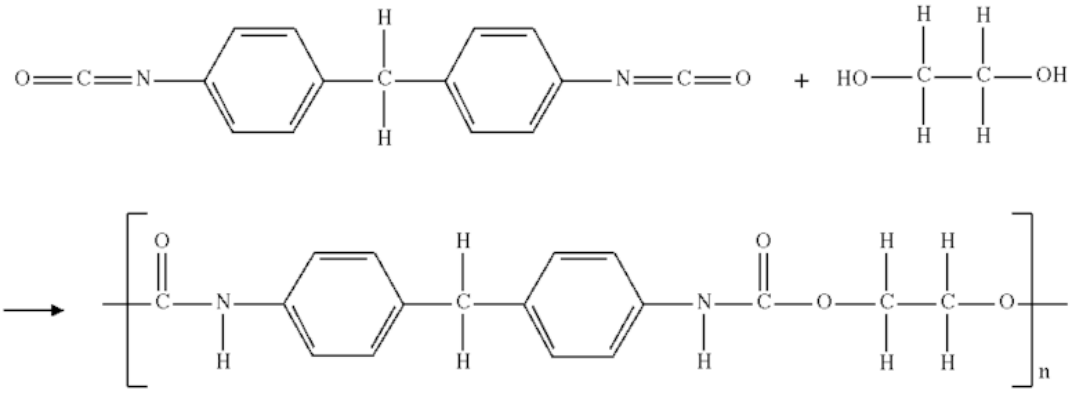
C04B 35/63456

{Polyurethanes; Polyisocyanates}

Definition statement

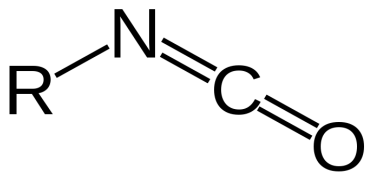
This place covers:

A polyurethane (PUR and PU) is any polymer composed of a chain of organic units joined by carbamate (urethane) links. Polyurethane polymers are formed through step-growth polymerization, by reacting a monomer (with at least two isocyanate functional groups) with another monomer (with at least two hydroxyl or alcohol groups) in the presence of a catalyst



Polyurethane synthesis, wherein the urethane groups — NH-(C=O)-O- link the molecular units

Isocyanate is the functional group of elements –N=C=O (1 nitrogen, 1 carbon, 1 oxygen), not to be confused with the cyanate functional group which is arranged as –O–C≡N or with isocyanide, R-N≡C. Any organic compound which contains an isocyanate group may also be referred to in brief as an isocyanate. An isocyanate may have more than one isocyanate group. An isocyanate that has two isocyanate groups is known as a diisocyanate



The isocyanate functional group

References

Limiting references

This place does not cover:

The use of polyurethanes in coatings of ceramic substrates	C04B 41/4884

Informative references

Attention is drawn to the following places, which may be of interest for search:

Polyurethanes and polyisocyanates added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/282, C04B 26/16
Binders for refractory mould or core materials based on resins or rosins obtained otherwise than by reactions only involving carbon-to-carbon unsaturated bonds: polyurethanes; polyisocyanates	B22C 1/2273
Polyurethanes	C08F 290/067, C08F 290/147, C08F 299/06, C08G 71/04, C08L 75/04, C08L 75/14, C09D 5/4465, C09D 175/00, C09D 175/04, C09J 175/00, C09J 175/04, C09K 3/1021, C09K 19/3885
Polyisocyanates	C08G 18/72, C09B 43/155, C09B 43/266, C09K 17/30

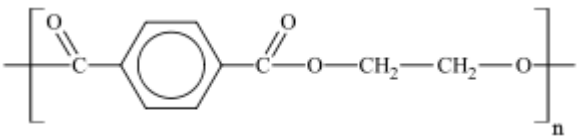
C04B 35/6346

{Polyesters}

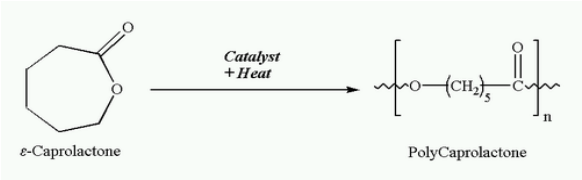
Definition statement

This place covers:

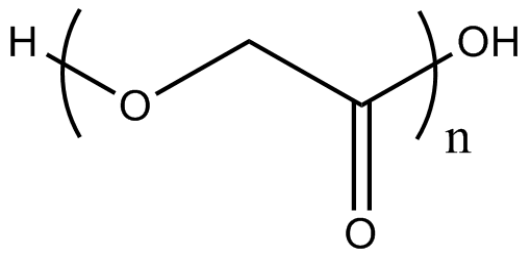
Polyester is a category of polymers which contain the ester functional group (-C(O)O-) in their main chain. A common polyester is for instance polyethylene terephthalate (PET)



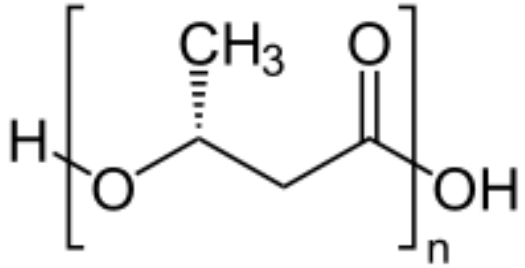
Polyethylene terephthalate



Polycaprolactone (PCL)



Polyglycolic acid (PGA)



poly-(R)-3-hydroxybutyrate (P3HB),

References

Limiting references

This place does not cover:

The use of polyesters in coatings of ceramic substrates	C04B 41/4826

Informative references

Attention is drawn to the following places, which may be of interest for search:

Polyesters added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/283 and subgroup, C04B 26/18
Binders for refractory mould or core materials based on resins or rosins obtained otherwise than by reactions only involving carbon-to-carbon unsaturated bonds: polyesters; polycarbonates	B22C 1/2266

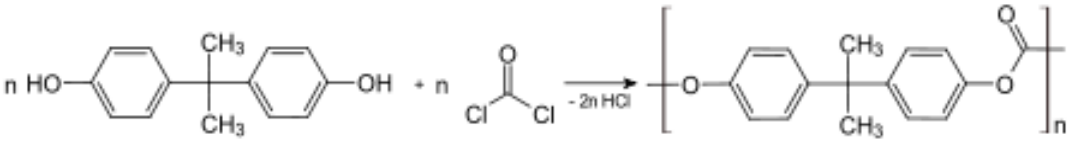
C04B 35/63464

{Polycarbonates}

Definition statement

This place covers:

Polycarbonates received their name because they are polymers containing carbonate groups (–O–(C=O)–O–). An example of a polycarbonate material is produced by the reaction of bisphenol A and phosgene $COCl_2$



References

Limiting references

This place does not cover:

The use of polycarbonates in coatings of ceramic substrates	C04B 41/4888

Informative references

Attention is drawn to the following places, which may be of interest for search:

Polycarbonates added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/286, C04B 26/18
Binders for refractory mould or core materials based on resins or rosins obtained otherwise than by reactions only involving carbon-to-carbon unsaturated bonds: polyesters; polycarbonates	B22C 1/2266

C04B 35/63468

{Polyamides}

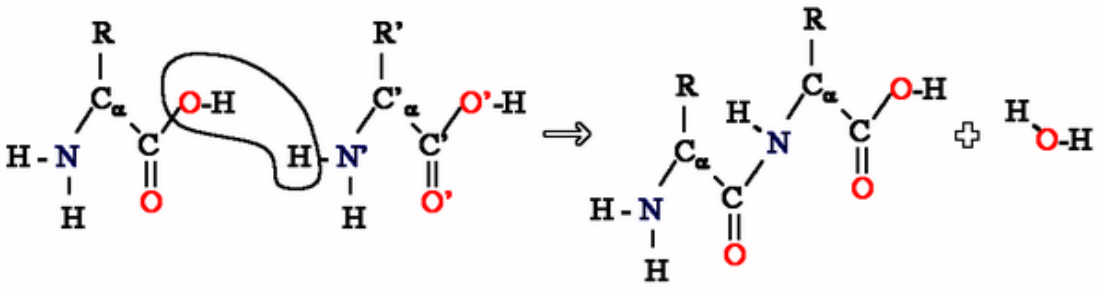
Definition statement

This place covers:

The amide link is produced from the condensation reaction of an amino group and a carboxylic acid or acid chloride group. A small molecule, usually water, or hydrogen chloride, is eliminated.

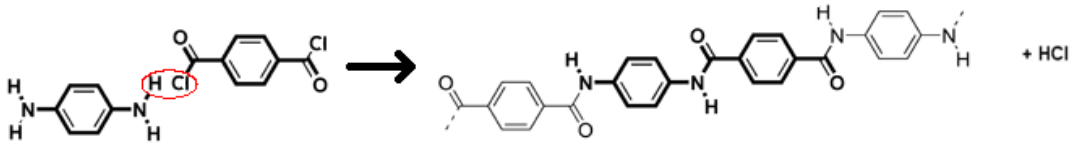
The amino group and the carboxylic acid group can be on the same monomer, or the polymer can be constituted of two different bifunctional monomers, one with two amino groups, the other with two carboxylic acid or acid chloride groups.

Amino acids can be taken as examples of single monomer (if the difference between R groups is ignored) reacting with identical molecules to form a polyamide:



The reaction of two amino acids. Many of these reactions produce long chain proteins

Aramid (pictured below) is made from two different monomers which continuously alternate to form the polymer and is an aromatic polyamide:



The reaction of 1,4-phenyl-diamine (para-phenylenediamine) and terephthaloyl chloride to produce Aramid

References

Limiting references

This place does not cover:

The use of polyamides in coatings of ceramic substrates	C04B 41/4892

Informative references

Attention is drawn to the following places, which may be of interest for search:

Polyamides added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/287, C04B 26/20
Binders for refractory mould or core materials based on resins or rosins obtained otherwise than by reactions only involving carbon-to-carbon unsaturated bonds: polyamides	B22C 1/228

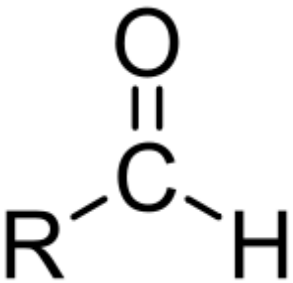
C04B 35/63472

{Condensation polymers of aldehydes or ketones}

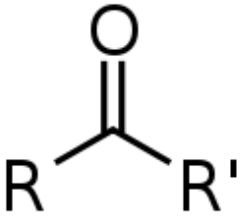
Definition statement

This place covers:

An aldehyde is an organic compound containing a formyl group. This functional group, with the structure R-CHO, consists of a carbonyl center bonded to hydrogen and an R group.[1] The group without R is called the aldehyde group or formyl group



a ketone is an organic compound with the structure RC(=O)R', where R and R' can be a variety of atoms and groups of atoms. It features a carbonyl group (C=O) bonded to two other carbon atoms.



References

Limiting references

This place does not cover:

The use of condensation polymers of aldehydes or ketones in coatings of ceramic substrates	C04B 41/4811

Informative references

Attention is drawn to the following places, which may be of interest for search:

Condensation polymers of aldehydes or ketones added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/30, C04B 26/12
Binders for refractory mould or core materials based on resins or rosins obtained otherwise than by reactions only involving carbon-to-carbon unsaturated bonds: condensation polymers of aldehydes and ketones	B22C 1/2246

C04B 35/63488

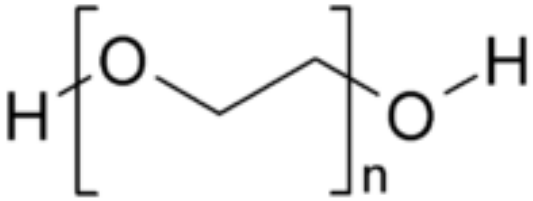
{Polyethers, e.g. alkylphenol polyglycolether, polyethylene glycol [PEG], polyethylene oxide [PEO]}

Definition statement

This place covers:

Ethers are a class of organic compounds that contain an ether group — an oxygen atom connected to two alkyl or aryl groups — of general formula R–O–R'.[1] A typical example is the solvent and anesthetic diethyl ether, commonly referred to simply as "ether" (CH_3-CH_2-O-CH_2-CH_3).

Polyether generally refers to polymers which contain the ether functional group in their main chain. The term glycol is reserved for low to medium range molar mass polymer when the nature of the end-group, which is usually a hydroxyl group, still matters. The term "oxide" or other terms are used for high molar mass polymer when end-groups no longer affect polymer properties.



PEG or PEO, depending on the n-number

References

Limiting references

This place does not cover:

The use of polyethers in coatings of ceramic substrates	C04B 41/4896

Informative references

Attention is drawn to the following places, which may be of interest for search:

Polyethers, e.g. alkylphenol polyglycolether added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/32
Binders for refractory mould or core materials based on resins or rosins obtained otherwise than by reactions only involving carbon-to-carbon unsaturated bonds: polyethers	B22C 1/2286

C04B 35/63492

{Natural resins, e.g. rosin}

Definition statement

This place covers:

Water-insoluble mixture of compounds derived from trees, especially conifers,

e.g. pine tar, pitch, gum, shellac.

Rosin is a solid form of resin obtained from pines and some other plants, mostly conifers

Relationships with other classification places

Derivatives of natural macromolecular compounds C08H

natural resins or their derivatives C09F

References

Limiting references

This place does not cover:

The use of wood waste material for making ceramics	C04B 35/62209
The use of natural resins in coatings of ceramic substrates	C04B 41/474

Informative references

Attention is drawn to the following places, which may be of interest for search:

Natural resins, e.g. rosin added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/34, C04B 26/22 and subgroup
Binders for refractory mould or core materials based on resins or rosins: natural polymers	B22C 1/2293

C04B 35/63496

{Bituminous materials, e.g. tar, pitch}

Definition statement

This place covers:

Bituminous materials such as tar or pitch are used as binder, either to be burned out later or to be carbonised and become part of the ceramic, as for instance carbon or carbide

Relationships with other classification places

bituminous materials C10

References

Limiting references

This place does not cover:

Impregnating a porous carbon product with tar or pitch that is carbonised into carbon	C04B 35/521
Carbon products obtained from carbonaceous particles with a carbonisable binder, such as tar or pitch	C04B 35/532
Using tar or pitch for joining ceramic with ceramic	C04B 37/008
Using tar or pitch for joining ceramic with metal	C04B 37/028
Using tar or pitch for joining ceramic with glass	C04B 37/047
Carbonaceous materials that are added to the ceramic material to create porosity after a heat treatment	C04B 38/068

Informative references

Attention is drawn to the following places, which may be of interest for search:

Bituminous materials, e.g. tar, pitch added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/36, C04B 26/26
Oxide ceramics containing carbon	C04B 35/013
Alumina refractories containing carbon	C04B 35/103
The use of bitumen, asphalt, e.g. paraffin in coatings of ceramic substrates	C04B 41/478
Carbonaceous additives to ceramics or secondary phases	C04B 2235/422 and subgroups
Organic additives are carbonised to become part of the ceramic	C04B 2235/48

Special rules of classification

If bituminous materials are added as binder to oxide ceramics, C04B 35/013 and C04B 35/63496 both are given.

C04B 35/636

Polysaccharides or derivatives thereof

Definition statement

This place covers:

The use of polysaccharides such as xanthan, dextrin as binder, or for other uses, e.g. starch, glycogen, chitin, xylan, pectins

Relationships with other classification places

Polysaccharides; derivatives thereof C08B

References

Limiting references

This place does not cover:

Polysaccharides that are added to the ceramic material to create porosity after a heat treatment	C04B 38/0645
The use of polysaccharides in coatings of ceramic substrates	C04B 41/4803

Informative references

Attention is drawn to the following places, which may be of interest for search:

Polysaccharides or derivatives thereof added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/38 and subgroups, C04B 26/28 and subgroup

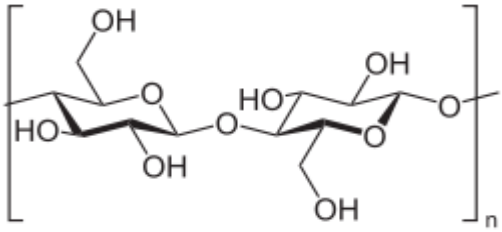
C04B 35/6365

{Cellulose or derivatives thereof}

Definition statement

This place covers:

Cellulose is an organic compound with the formula $(C_6H_{10}O_5)n$, a polysaccharide consisting of a linear chain of several hundred to over ten thousand β(1→4) linked D-glucose units. It is often used as binder and does not leave carbon residue normally.



Relationships with other classification places

Production of cellulose D21

References

Limiting references

This place does not cover:

Cellulose materials that are added to the ceramic material to create porosity after a heat treatment	C04B 38/0675
The use of cellulose in coatings of ceramic substrates	C04B 41/476

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of organic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of organic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: cellulose	C04B 16/02
Cellulose or derivatives thereof added as active ingredient to cement, concrete, mortar or artificial stone	C04B 24/383 and subgroup, C04B 26/24, C04B 26/285
The use of wood waste material for making ceramics	C04B 35/62209
Preparatory treatment of cellulose for making derivatives thereof	C08B 1/00 and subgroups

C04B 35/638

Removal thereof

Definition statement

This place covers:

Burning out the organics of green shaped ceramics or of unshaped ceramic powder mixtures, or of ceramic-polymer fibers, e.g. barium titanate-PVP fibers. Removing the organics by using solvents.

References

Limiting references

This place does not cover:

Creating porous ceramics by dissolving-out added substances	C04B 38/04
Creating porous ceramics by burning-out added substances by burning natural expanding materials or by sublimating or melting out added substances	C04B 38/06 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Specific temperature used for heat treatment step of shaped ceramic	C04B 2235/656
Heating rate of heat treatment step of shaped ceramic	C04B 2235/6562
Cooling rate of heat treatment step of shaped ceramic	C04B 2235/6565
Treatment time of heat treatment step of shaped ceramic	C04B 2235/6567
Multi step sintering	C04B 2235/661
Removing of binder during sintering of metallic articles	B22F 3/1021 and subgroup
General overview over methods for debinding	document XP004301883

Special rules of classification

If heating rate, cooling rate and heating time of the binder burn-out step are specified, C04B 2235/656 and subgroups can be used.

C04B 35/64

Burning or sintering processes (C04B 33/32 takes precedence; {powder metallurgy B22F})

Definition statement

This place covers:

All specific burning and sintering methods used for shaped ceramic materials, e.g. using a specific heating or cooling rate, a specific furnace, a specific atmosphere

Relationships with other classification places

Powder metallurgy B22F

Furnaces, kilns, ovens, or retorts F27

References

Limiting references

This place does not cover:

Burning methods for clay-wares	C04B 33/32 and subgroups
Heat treatments of non-shaped powders that are used for making ceramics	C04B 35/62645 and subgroups

Superficial sintering of clay or ceramic objects with the goal of creating a porous object	C04B 38/0038 and subgroup
Manufacture of workpieces or articles from metallic powder characterised by the manner of compacting or sintering; Apparatus specially adapted therefore; Presses and furnaces	B22F 3/00 and subgroups
Manufacture of composite layers, workpieces, or articles, comprising metallic powder, by sintering the powder, with or without compacting wherein at least one part is obtained by sintering or compression	B22F 7/00 and subgroups
Mechanical aspects of sintering clay or ceramic objects	B28B 11/243
Chamber type furnaces	F27B 17/0016 and subgroups
Travelling or movable supports or containers for the charge of furnaces, kilns, ovens, retorts in so far as they are of kinds occurring in more than one kind of furnace	F27D 3/12 and subgroup

Informative references

Attention is drawn to the following places, which may be of interest for search:

Heat treatment, e.g. precalcining, burning, melting; Cooling of hydraulic cements	C04B 7/43 and subgroups
Processes, in general, for influencing or modifying the properties of mortars, concrete or artificial stone compositions: making use of a rise in temperature, e.g. caused by an exothermic reaction	C04B 40/0082
Processes, in general, for influencing or modifying the properties of mortars, concrete or artificial stone compositions: heating up to sintering temperatures	C04B 40/0268
After-treatment of mortars, concrete, artificial stone or ceramics: heat treatment	C04B 41/0072
Aspects relating to heat treatment of ceramic bodies such as green ceramics or pre-sintered ceramics, e.g. burning, sintering or melting processes	C04B 2235/65 and subgroups
Using setters during sintering	C04B 2235/9623
Sintering glass	C03B 19/06 and subgroups
Abrasive particles per se obtained by division of a mass agglomerated by sintering	C09K 3/1418
Shaft or like vertical or substantially vertical furnaces wherein no smelting of the charge occurs, e.g. calcining or sintering furnaces	F27B 1/005, F27B 1/005

Special rules of classification

When giving this class, it should be checked if one of the heat treatment symbols from the range C04B 2235/65-C04B 2235/668 is applicable. If so, this symbol should be given as well.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Selective Laser Sintering (SLS)	A layer of ceramic powder is deposited on a support, and possibly compacted by a rolling device. A computer-controlled laser beam scans a two-dimensional cross-section of a part, selectively sintering the layer. A new layer of powder is deposited, compacted and sintered. After completion of the part, the unfused or unsintered powder, which helps hold the part during the process, is removed. This technique may allow local composition variations for gradient materials or manufacture of composites.

C04B 35/645

Pressure sintering

Definition statement

This place covers:

Methods such as sinterforging, SPS (spark plasma sintering).

Relationships with other classification places

Presses in general B30B

References

Limiting references

This place does not cover:

Pressing and heating of the clay green compact at the same time at temperatures lower than the sintering temperature	C04B 33/20
Pressing clay at sintering temperatures	C04B 33/326
Pressure sintering to make silicon carbide based ceramics	C04B 35/575
Pressure sintering to make silicon nitride based ceramics	C04B 35/593
Using a pressurised atmosphere during sintering, e.g. an atmosphere of 2 bar nitrogen	C04B 2235/658
Using constraining layers before or during sintering of ceramic laminates or ceramic substrates that are joined with other substrates	C04B 2237/56 and subgroups
Processes using ultra high pressure, e.g. for the formation of diamonds; Apparatus therefore, e.g. moulds, dies	B01J 3/06 and subgroups
Mechanical aspects of hot-pressing clay or ceramic materials	B28B 3/025

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pressing at non-sintering temperatures of ceramic or refractory mixtures	C04B 2235/604
Spark plasma sintering	C04B 2235/666
Density of sintered ceramics	C04B 2235/77
Both compacting and sintering of metallic articles	B22F 3/12
Both compacting and sintering of metallic articles by forging	B22F 3/17

Hot-pressing glass powder	C03B 19/063

Special rules of classification

When giving this class, it should be checked if one of the symbol from the range C04B 2235/65-C04B 2235/668 is applicable. If so, this symbol should be given as well. If SPS is used, C04B 2235/666 should be given as well.

C04B 35/6455

{Hot isostatic pressing}

Definition statement

This place covers:

Hot isostatic pressing, using normally a gas to transmit the pressure

References

Limiting references

This place does not cover:

Gas pressure sintering to make silicon carbide based ceramics	C04B 35/5755
Gas pressure sintering to make silicon nitride based ceramics	C04B 35/5935
Using a pressurised atmosphere during sintering, e.g. an atmosphere of 2 bar nitrogen	C04B 2235/658

Informative references

Attention is drawn to the following places, which may be of interest for search:

Joints of implantable prostheses, made by hot isostatic pressing (HIP)	A61F 2002/30986
Hot isostatic pressing of workpieces or articles from metallic powder	B22F 3/15 and subgroup
Hot isostatic pressing of metals or alloys	C21D 2241/02

Special rules of classification

When giving this class, it should be checked if one of the symbols from the range C04B 2235/65-C04B 2235/668 is applicable. If so, this symbol should be given as well. Usually there is a pre-sintering step before HIP. The use of a presintering step can be indicated with C04B 2235/661.

C04B 35/65

Reaction sintering of free metal- or free silicon-containing compositions {(C04B 35/573, C04B 35/591 take precedence)}

Definition statement

This place covers:

A ceramic is made by reacting a metal or silicon, with oxygen (oxidising to make an oxide), with carbon (to make a carbide), with boron (to make a boride), with nitrogen (nitriding to make a nitride), or with either a free metal or free silicon to make a silicide. The majority of the ceramic has to be made by reaction sintering. Examples are the reaction of a metal such as molybdenum with silicon to make

molybdenum silicide, reacting aluminium with nitrogen to make aluminium nitride, reacting nickel with oxygen to make nickel oxide, reacting titanium with carbon to make titanium carbide, reacting magnesium with boron to make magnesium boride.

References

Limiting references

This place does not cover:

Making silicon carbide by reaction sintering	C04B 35/573
Making silicon nitride by reaction sintering	C04B 35/591
Reaction sintering to make a material containing for the majority ceramic phases resulting from the reaction, but a minority of metallic phase, where the metallic phase is continuous, e.g. functions as a binder	C22C 1/058

Informative references

Attention is drawn to the following places, which may be of interest for search:

Reacting a material with a gas, other than oxygen, to create a ceramic phase, e.g. reacting with nitrogen to make a nitride	C04B 2235/46 and subgroup
Manufacture of workpieces or articles from metallic powder involving a self-propagating high-temperature synthesis or reaction sintering step	B22F 3/23

C04B 35/651

{Thermite type sintering, e.g. combustion sintering}

Definition statement

This place covers:

Thermite is a pyrotechnic composition of a metal powder and a metal oxide that produces an exothermic oxidation-reduction reaction known as a thermite reaction. If aluminium is the reducing agent it is called an aluminothermic reaction. Thermites can be a diverse class of compositions. Some "fuels" that can be used include aluminium, magnesium, calcium, titanium, zinc, silicon, and boron and others. One commonly-used fuel in thermite mixtures is aluminium, because of its high boiling point. The oxidizers can be boron(III) oxide, silicon(IV) oxide, chromium(III) oxide, manganese(IV) oxide, iron(III) oxide, iron(II,III) oxide, copper(II) oxide, and lead(II,III,IV) oxide and others.

The aluminium reduces the oxide of another metal, most commonly iron oxide, because aluminium is highly reactive:

$Fe_2O_3 + 2Al \rightarrow 2Fe + Al_2O_3$

References

Limiting references

This place does not cover:

Heating methods that result in the oxidation or reduction of powders, preparatory to the making of a ceramic material	C04B 35/6265
Pyrolysis, carbonisation or auto-combustion reactions for making ceramic powder	C04B 35/6267

Informative references

Attention is drawn to the following places, which may be of interest for search:

Reductive heat treatment for making a ceramic	C04B 2235/652
Oxidative annealing	C04B 2235/663
Reductive annealing	C04B 2235/664

C04B 35/652

{Directional oxidation or solidification, e.g. Lanxide process}

Definition statement

This place covers:

The Lanxide process, also known as pressureless metal infiltration, is a way of producing metal-matrix composite materials by a process of partial reaction; the process involves a careful choice of initial alloy (usually aluminium with about 3% magnesium and about 10% silicon), and then the maintenance of conditions in which the polycrystalline reaction product has a mechanical composition such that metal is drawn up through it towards the oxidiser by capillary action, so the composite material grows downwards. The normal application is to produce alumina-reinforced aluminium; the process also allows the growth of ceramic layers inside metal encasements, providing pre-stressing. A metal melt is simultaneously both oxidised and solidified, in a directional way, meaning the oxidation and solidification start at one end of the material and progress towards the other end. This can also be done with a powder bed, in which case there is only directional oxidation.

References

Limiting references

This place does not cover:

Porous ceramic starting from inorganic materials only, e.g. metal foam; Lanxide type products	C04B 38/0025

Informative references

Attention is drawn to the following places, which may be of interest for search:

Making ceramics by making use of a melting process	C04B 35/653 and subgroup
Porous mortars, concrete, artificial stone or ceramic ware obtained by a chemical conversion or reaction other than those relating to the setting or hardening of cement-like material or to the formation of a sol or a gel, e.g. by carbonising or pyrolysing preformed cellular materials based on polymers, organo-metallic or organo-silicon precursors: starting from inorganic materials only, e.g. metal foam; Lanxide type products	C04B 38/0025
Directionally solidified metal castings	B22D 27/045
Directionally-solidified crystalline structure	F05C 2253/083 and subgroup

C04B 35/653

Processes involving a melting step

Definition statement

This place covers:

Making a bulk ceramic object by melting at least the largest part of a badge of material

References

Limiting references

This place does not cover:

Melting clay materials to make a clay ceramic object	C04B 33/323
Melting material in order to make ceramic powder	C04B 35/62665

Informative references

Attention is drawn to the following places, which may be of interest for search:

Artificial stone from molten metallurgical slag	C04B 5/00 and subgroups
Artificial stone obtained by melting at least part of the composition, e.g. metal	C04B 32/005
Porous clay ceramics obtained by generating pores in the ceramic material while in the molten state	C04B 38/0087
Processes, in general, for influencing or modifying the properties of mortars, concrete or artificial stone composition: involving melting of at least part of the composition	C04B 40/0085
Thermally activated mortars, e.g. by melting ingredients	C04B 40/0691
Coating or impregnating “in situ”, e.g. impregnating of artificial stone by subsequent melting of a compound added to the artificial stone composition	C04B 41/0018
Coating or impregnating applied from the molten state; Thermal spraying, e.g. plasma spraying	C04B 41/4523 and subgroup
Superficial melting of the ceramic substrate before or during the coating or impregnating step	C04B 41/4588
Heat treatments such as] Calcining; Fusing Pyrolysis in general	B01J 6/00 and subgroups
Casting non-ferrous metals with a high melting point, e.g. metallic carbides	B22D 21/06
Shaping methods specially adapted for producing clay or ceramic articles from molten material, e.g. slag refractory ceramic materials	B28B 1/54, B28B 1/54
Abrasive particles per se obtained by division of a mass agglomerated by melting, at least partially, e.g. with a binder	C09K 3/1427
Making hard metals based on borides, carbides, nitrides, oxides, silicides starting from a melt	C22C 1/1068

Special rules of classification

When giving this class, it should be checked if one of the symbols from the range C04B 2235/65-C04B 2235/668 is applicable. If so, this symbol should be given as well.

C04B 35/657

for manufacturing refractories (C04B 35/05, C04B 35/107, C04B 35/484 take precedence)

Definition statement

This place covers:

Making a bulk ceramic refractory object by melting at least the largest part of a badge of material

References

Limiting references

This place does not cover:

Magnesia-based refractories made by fusion casting	C04B 35/05 and subgroup
Alumina-based refractories made by fusion casting	C04B 35/107 and subgroup
Zirconia-based refractories made by fusion casting	C04B 35/484

Informative references

Attention is drawn to the following places, which may be of interest for search:

Melting clay materials to make a clay ceramic object	C04B 33/323
Melting material in order to make ceramic powder	C04B 35/62665
Applying ceramic coatings by spraying the coating material in the molten state, e.g. by flame, plasma or electric discharge	C23C 4/10 and subgroup

C04B 35/66

Monolithic refractories or refractory mortars, including those whether or not containing clay {(making or repairing of linings F27D 1/16)}

Definition statement

This place covers:

All refractory compositions that do not have as largest fraction magnesia, alumina or zirconia, e.g. a refractory composition with titania or silicon carbide as largest fraction

References

Limiting references

This place does not cover:

Grain-sized magnesia-based refractories	C04B 35/043 and subgroups
Grain-sized alumina-based refractories	C04B 35/101 and subgroups
Grain-sized zirconia-based refractories	C04B 35/482
Making refractory metal carbides	C04B 35/5607 and subgroups

Making refractory metal nitrides	C04B 35/58007 and subgroups
Making refractory metal borides	C04B 35/58064 and subgroups
Making refractory metal silicides	C04B 35/58092

Informative references

Attention is drawn to the following places, which may be of interest for search:

Re-using refractory waste for making clay ceramics	C04B 33/1324
Grain-sized titania-based refractories	C04B 35/46 and C04B 35/66
Grain-sized silicon carbide based refractories	C04B 35/565 and C04B 35/66
Cement, concrete, mortar or artificial stone being refractory	C04B 2111/00431
Cement, concrete, mortar or artificial stone as a refractory coating, e.g. for tamping	C04B 2111/00551
Cement, concrete, mortar or artificial stone composition being cement free, being calciumaluminate-free refractories	C04B 2111/1043
Using insulating materials or refractories in chemical or physical processes	B01J 2208/00495
Molecular sieve catalysts supported in or on refractory materials	B01J 2229/64
Compositions of refractory mould or core materials; Grain structures thereof	B22C 1/00 and subgroups
Hot tops from refractory material for ingot moulds	B22D 7/102
Linings for casting melt-holding vessels, e.g. ladles, tundishes, cups or the like	B22D 41/02 and subgroups
Refractory plugging masses for melt-holding vessels, e.g. ladles, tundishes, cups or the like	B22D 41/46 and subgroup
Soldering or welding materials comprising refractory compounds, e.g. carbides	B23K 35/327, B23K 35/327
Fireproof paints including high temperature resistant paints	C09D 5/18 and subgroup
Miscellaneous materials being Fire-resistant, heat-resistant materials	C09K 2003/1078
Fireproofing materials	C09K 21/00 and subgroups
Blast furnaces with special refractories, e.g. linings	C21B 7/04 and subgroup
Opening or sealing the tap holes of blast furnaces with refractory plugging mass	C21B 7/125
Refractory linings for carbon-steel converters	C21C 5/44, C21C 5/44 and subgroups
Refractory coated lances; Immersion lances for carbon-steel converters	C21C 5/4613, C21C 5/4613
Coating metal with enamels or vitreous layers: with refractory materials	C23D 5/10, C23D 5/10
Refractory bricks or blocks specially shaped for burner openings	F23M 5/025

Making or repairing of linings	F27D 1/16, F27D 1/16 and subgroups
Cooling of furnaces the cooling medium passing through a pattern of tubes integrated with refractories in a panel	F27D 2009/0032

C04B 35/71

Ceramic products containing macroscopic reinforcing agents (C04B 35/66 takes precedence; {infiltration of a porous ceramic matrix with a material forming a non-ceramic phase C04B 41/00, reaction infiltration with Si in order to form SiC C04B 35/573, in order to form Si_3N_4 C04B 35/591})

Definition statement

This place covers:

A ceramic matrix contains fibers, whiskers, platelets, nanofibers, nanotubes

References

Limiting references

This place does not cover:

Reinforced clay wares	C04B 33/36
Making SiC by reactive infiltration of carbon body with Si	C04B 35/573
Making Si_3N_4 by reactive infiltration of carbon body with nitrogen or nitrogen containing materials	C04B 35/591
Monolithic refractories or refractory mortars	C04B 35/66
Ceramics containing macroscopic reinforcements that are removed to create porosity	C04B 38/06 and subgroups
Infiltration of a porous ceramic matrix with a material forming a non-ceramic phase	C04B 41/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Arrangements specially adapted for the production of shaped ceramic articles with elements wholly or partly embedded in the moulding material; Production of reinforced objects	B28B 23/00 and subgroups
Metallic alloys containing fibers and filaments	C22C 47/00, C22C 49/00 and subgroups

Special rules of classification

The symbols from the range C04B 2235/5208-C04B 2235/5296 can be used to indicate which macroscopic reinforcement is being used.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

CMC	ceramic matrix composite

C04B 35/74

containing shaped metallic materials

Definition statement

This place covers:

A ceramic matrix containing shaped metallic material, where the shaped material is not a fiber, whisker, platelet, filament.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Metal as starting material for making ceramics or as secondary phase of a sintered ceramic, not being present as a binding phase, e.g. La, Y, Mn, Re, Zn, Ga, In, Ge, Sb, Pb, Bi	C04B 2235/40 and subgroups

C04B 35/76

Fibres, filaments, whiskers, platelets, or the like

Definition statement

This place covers:

A ceramic matrix containing for instance steel fibers, aluminium platelets, titanium nanofibers, etc.

References

Limiting references

This place does not cover:

Mechanical aspects of shaping ceramic objects containing metallic fibers	B28B 1/523, B28B 1/523

Informative references

Attention is drawn to the following places, which may be of interest for search:

Metallic fibers or whiskers added as filler to concrete, cement, mortar or artificial stone	C04B 14/48
Fiber or whisker reinforced substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/38
Metallic fibers per se	B22F 1/004
Manufacture of articles essentially made from metallic fibres	B22F 3/002
Making alloys containing metallic or non-metallic fibres or filaments	C22C 47/00 and subgroups
Alloys containing metallic or non-metallic fibres or filaments	C22C 49/00 and subgroups
Non-woven fabrics formed wholly or mainly of staple fibres or like relatively short fibre: metal fibers	D04H 1/4234, D04H 1/4234
Sealings containing metallic fibers	F16J 15/126

C04B 35/78

containing non-metallic materials

Definition statement

This place covers:

Ceramic matrix with ceramic, glass reinforcement

C04B 35/80

Fibres, filaments, whiskers, platelets, or the like {(carbon reinforced with carbon fibres see C04B 35/83)}

Definition statement

This place covers:

The ceramic matrix is reinforced with ceramic fibers, ceramic whiskers, ceramic nanotubes, silicon fibers

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Making ceramic fibers per se	C04B 35/62227
Coating the ceramic fibers or inorganic fibers used in ceramics	C04B 35/62844 and subgroups
Carbon reinforced with carbon fibers	C04B 35/83
Using inorganic fibers for ceramics	C04B 2235/5216 and subgroups
Using inorganic whiskers, spindles, needles, pins for ceramics	C04B 2235/5276
Using hollow fibers for ceramics, e.g. nanotubes	C04B 2235/5284 and subgroup
Using flakes, platelets, plates for ceramics	C04B 2235/5292
Fiber or whisker reinforced substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/38

Special rules of classification

The symbols from the range C04B 2235/5208-C04B 2235/5296 can be used to indicate which macroscopic reinforcement is being used.

C04B 35/803

{The matrix of the ceramic products consisting of oxides only}

Definition statement

This place covers:

The ceramic matrix is reinforced with ceramic fibers, ceramic whiskers, ceramic nanotubes, silicon fibers, where the matrix contains for the majority oxide materials, thus allowing a minority of non-oxide material. The fibers can be both oxidic and non-oxidic.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on oxides	C04B 35/01 and subgroups
Composition of friction linings based on metals or inorganic oxides, containing fibres	F16D 69/028

Special rules of classification

The material of the matrix phase normally receives a class from the range of oxide ceramics, C04B 35/01-C04B 35/51.

C04B 35/806

{The matrix of the ceramic products consisting of non-oxides only}

Definition statement

This place covers:

The ceramic matrix is reinforced with ceramic fibers, ceramic whiskers, ceramic nanotubes, silicon fibers, where the matrix contains for the majority non-oxide materials, thus allowing a minority of oxide material. The non-oxide material can be carbon, carbide, nitride, boride, silicide. The fibers can be both oxidic and non-oxidic.

References

Limiting references

This place does not cover:

A carbon matrix containing carbon fibers or nanotubes	C04B 35/83

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on non-oxides	C04B 35/515 and subgroups

Special rules of classification

The material of the matrix phase normally receives a class from the range of non-oxide ceramics, C04B 35/515-C04B 35/597.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

SiC/SiC	Silicon carbide reinforced with silicon carbide fibers

C04B 35/82

Asbestos; Glass; Fused silica

Definition statement

This place covers:

The ceramic matrix is reinforced with asbestos, glass fibers or fused silica fibers or whiskers. The matrix can be both oxide and non-oxide.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Asbestos used as fillers, e.g. pigments, for mortars, concrete or artificial stone	C04B 14/40 and subgroup
Glass fibers or whiskers added as filler to concrete, cement, mortar or artificial stone	C04B 14/42 and subgroup
Hazardous waste used for making clay materials, the waste not being a combustion residue	C04B 33/1325
Melting of material to make a ceramic powder	C04B 35/62665
Silicon oxide, silicic acids, or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. silica sol, fused silica, silica fume, cristobalite, quartz or flint (glass constituents C04B 2235/36), e.g. silicic acid $H_2Si_2O_5$	C04B 2235/3418
Glass starting materials for making ceramics, e.g. silica glass	C04B 2235/36 and subgroup
Silicate other than alumino-silicate or silica fibers used as starting material for making ceramics, e.g. quartz fibers	C04B 2235/5232
Filtering material for liquid or gaseous fluids, containing inorganic material, e.g. asbestos fibres, glass beads or fibres	B01D 39/06
Disposal of asbestos	B09B 3/0066
Layered products essentially comprising sheet glass, or glass, slag, or like fibres	B32B 17/00 and subgroups
Layered products essentially comprising natural mineral fibres or particles, e.g. asbestos	B32B 19/08, B32B 2315/12
Processes specially adapted for the production of quartz or fused silica articles	C03B 20/00
The synthesis of glass fibers	C03B 37/01 and subgroups
Glass fibre or filament compositions	C03C 13/00 and subgroups
Use of asbestos fibers as ingredient for polymers	C08K 7/12
Yarns or threads made from asbestos	D02G 3/20
Woven glass fibers	D03D 15/0011
Fleeces or layers composed of fibres that are not woven, glass fibers	D04H 1/4218 and subgroup, D04H 5/12, D04H 13/008

Treating fibers made of asbestos	D06M 7/005
Inorganic fibres based on oxides or oxide ceramics, e.g. silicates, Asbestos	D10B 2101/04
Composition of friction linings containing asbestos	F16D 69/021 and subgroup
Insulators mainly consisting out of asbestos	H01B 3/06 and subgroup
Insulators containing quartz; glass; glass wool; slag wool; vitreous enamels	H01B 3/08 and subgroups

C04B 35/83

Carbon fibres in a carbon matrix

Definition statement

This place covers:

A matrix consisting for the largest part out of carbon phase, e.g. amorphous carbon, graphite, diamond, which contains carbon fibers, carbon nanotubes. The carbon fibers or nanotubes can contain a non-carbon coating, although usually such an intermediate coating will be made of carbon.

References

Limiting references

This place does not cover:

A carbide matrix containing carbon fibers	C04B 35/806, C04B 35/56 or subgroup, C04B 2235/5248
A carbon matrix containing carbide fibers	C04B 35/806, C04B 35/52 or subgroup, C04B 2235/524 or C04B 2235/5244
A carbon matrix containing non-carbon fibers having a carbon coating	C04B 35/806, C04B 35/52 or subgroup, C04B 2235/5208 or subgroup, C04B 35/62873

Informative references

Attention is drawn to the following places, which may be of interest for search:

Carbon fibers or whiskers added as filler to concrete, cement, mortar or artificial stone	C04B 14/386
Carbon-based ceramics	C04B 35/52 and subgroups
Coating inorganic fibers with a carbon coating	C04B 35/62873
Carbon fibers used in ceramics	C04B 2235/5248
Carbon nanotubes used in ceramics	C04B 2235/5288
Carbon fiber or whisker reinforced carbon substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/385

Prosthesis containing Carbon reinforced with carbon fibres	A61F 2002/5055 , A61F 2/30965, A61F 2002/5055
Friction linings; Attachment thereof; Selection of co-acting friction substances or surfaces, the lining made of composite materials containing carbon and carbon fibres or fibres made of carbonizable material	F16D 69/023

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

C/C, CFC	Carbon fibres in a carbon matrix

C04B 37/00

Joining burned ceramic articles with other burned ceramic articles or other articles by heating (laminated products B32B, E04C; {soldering and welding materials B23K 35/24})

Definition statement

This place covers:

Joining ceramic articles with other ceramic articles through heating is in the groups C04B 37/001 - C04B 37/008. In principle the head-group C04B 37/00 should not be used for joining a ceramic substrate with another ceramic substrate, since the joining is either direct (C04B 37/001) or through an interlayer (C04B 37/003 or C04B 37/008), but there are no other options. The joining of ceramic articles through heating with articles that are not metal nor glass nor ceramic is also in C04B 37/003 and C04B 37/008. This can be for instance the joining of a ceramic substrate with a silicon substrate, a wood substrate, etc. If the joining of the ceramic substrate with for instance the silicon would be direct joining, C04B 37/001 is not applicable, since this is only for ceramic-ceramic joining. In this case C04B 37/00 is used.

A ceramic article or other article is any pre-shaped from. This also includes pre-shaped films or foils that are joined to another object, e.g. first making a diamond thin film by CVD, lifting this film from its substrate and joining the film with a carbide substrate. If a substrate is coated with two coatings, and on top of the two coatings a foil is applied, the foil is seen as a substrate, which means this is coded in C04B 37/00.

The joining can also mean joining two objects through spacers that actually keep the two objects apart. The two objects do not make direct contact, but are joined through the spacer(s).

Normally a joint between a cermet and a metal substrate is not classified in C04B 37/00, but in the case that a porous ceramic is joined to a metal through a metal infiltrated in the porous ceramic, this is classified in C04B 37/00(using the code C04B 2237/61).

References

Limiting references

This place does not cover:

Joining individual ceramic particles with other ceramic particles	C04B 35/6303 (inorganic binders) C04B 35/632 (organic binders)
Coating a ceramic substrate with a preformed sheet-like element	C04B 41/4501

Joining plastics material to carbon	B29C 66/7444 , B29C 66/7444
Joining plastics material to ceramics	B29C 66/7461 , B29C 66/7461 and subgroup
Application of procedures in order to connect objects or parts, e.g. coating with sheet metal otherwise than by plating	B32B 15/00
Joining a ceramic layer with a polymer/plastic layer through heating, unless the polymer/plastic is an adhesive that functions as an interlayer for two other substrates, of which at least one is ceramic	

Informative references

Attention is drawn to the following places, which may be of interest for search:

Clay-wares	C04B 33/00 and subgroups
Porous ceramic products	C04B 38/00
Honeycomb structures assembled from subunits	C04B 38/0016
Coating ceramic substrates	C04B 41/00 and subgroups
Aspects relating to ceramic starting mixtures or sintered ceramic products	C04B 2235/00 and subgroups
Aspects relating to ceramic laminates or to joining of ceramic articles with other articles by heating	C04B 2237/00 and subgroups
Application of procedures in order to connect objects or parts, e.g. coating with sheet metal otherwise than by plating	B21D 39/00
Friction heat forging	B21J 5/063
Riveting	B21J 15/00
Uniting components to form integral members, e.g. turbine wheels and shafts, caulks with inserts, with or without shaping of the components	B21K 25/00
Soldering or unsoldering; welding; cladding or plating by soldering or welding; cutting by applying heat locally e.g. flame cutting; working by laser beam	B23K
Soldering and welding materials	B23K 35/24
Connecting metal parts or objects by metal-working techniques, not covered wholly by either B21J or B23K	B23P 11/00
Joining or sealing of preformed parts, e.g. welding of plastics materials; Apparatus therefore	B29C 65/00, B29C 65/00 and subgroups
Laminated products	B32B
Laminated products composed mainly of ceramics, e.g. refractory materials	B32B 18/00
Printing on laminates	B32B 38/14 and subgroup
Uniting glass pieces by fusing without substantial reshaping	C03B 23/20
Joining pieces of glass to pieces of other inorganic material; Joining glass to glass other than by fusing	C03C 27/00

Coating a metallic substrate with a ceramic coating	C23C
Structural elements; building materials	E04C
Joining constructional elements in general	F16B
Connecting constructional elements or machine parts by sticking or pressing them together, e.g. cold pressure welding	F16B 11/00
Seals between parts of vessels of electric discharge tubes or discharge lamps	H01J 5/20

Special rules of classification

In C04B 37/00 and subgroups the emphasis is on how the articles are joined. If the emphasis is not on the joining aspect, classification in other technical fields, mainly B32B, should be considered. If two ceramic layers are joined, but the emphasis is not on how they are joined, classification in B32B 18/00 takes place.

Secondary aspects of making ceramic laminates (B32B 18/00) and of joining ceramic articles with other articles through heating (C04B 37/00 and subgroups) are classified in C04B 2237/00 and subgroups, e.g. the composition of the layers or articles that are laminated or joined, the composition of the interlayers that are used for joining, processing aspects such as surface treatments to the layers-to-be-joined and also the geometrical configuration of the articles that are joined, e.g. joining both layers on their small side or one layer on the largest surface with one layer on the shortest surface.

Aspects regarding the heat treatments that are used are classified in C04B 35/64 and subgroups and coded in C04B 2235/65 and subgroups, where the heat treatment of the joining step should be seen as a sintering step. If for instance pressure is exerted during heating to join the articles, C04B 35/645 is given. Aspects regarding the atmosphere of the heating step, possible annealing steps, heating rate, cooling rate, etc. are classified in C04B 2235/65 and subgroups.

If much detail regarding the composition and/or synthesis of one or more ceramic layers or articles is given, classification in C04B 35/00 and subgroups should be considered. If much detail regarding the composition and/or synthesis of one or more metallic layers or articles is given, classification in B22F 3/00 or B22F 5/00 and subgroups should be considered.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

A ceramic article	an article made of material that is classified in C04B 33/00(clay materials), C04B 35/00- C04B 35/597 (ceramic materials), C04B 35/62204 (ceramic materials made out of waste material) and C04B 35/71- C04B 35/83 (ceramic materials containing macroscopic reinforcing agents).

Synonyms and Keywords

In patent documents, the following words/expressions are often used with the meaning indicated:

"oxides, phosphates, carbon-based materials, carbides, nitrides, borides, silicides, fluorides, sulphides, selenides	"ceramic materials".

C04B 37/001

{directly with other burned ceramic articles}

Definition statement

This place covers:

Joining the two ceramic articles without the use of an interlayer. The surface of one or more of the ceramic articles to-be-joined can be treated, e.g. by cleaning or oxidising, leading to an oxidised surface, or can for instance be wetted, but no external layer is applied to any of the surfaces to-be-bonded. An interlayer could be formed by bonding.

Special rules of classification

In the case the direct bonding results in the in-situ formation of an interlayer, the interlayer is indicated with a symbol from C04B 2237/02-C04B 2237/16.

Non-bonding electrode layers do not count as interlayer. If two substrates contain only a non-bonding electrode in between, these substrates are regarded to be directly bonded.

C04B 37/003

{by means of an interlayer consisting of a combination of materials selected from glass, or ceramic material with metals, metal oxides or metal salts}

Definition statement

This place covers:

A layer/coating is externally applied on at least one of the two substrates, or a foil or sheet is laid in between the two substrates, e.g. the interlayer is Si. Bonding through the use of pre-ceramic polymers, such as polycarbosilane, polysiloxane, polysilazane, as adhesive.

References

Limiting references

This place does not cover:

The creation of an internal layer within the substrate before bonding, e.g. by oxidising the surface or otherwise treating the surface	C04B 37/001 (direct bonding of ceramics)
Ceramic substrates containing a non-bonding electrode layer in between.	B32B 18/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Honeycomb structures characterised by the material used for sealing or plugging (some of) the channels of the honeycombs	C04B 38/0012
Honeycomb structures assembled from subunits characterised by the material used for joining separate subunits	C04B 38/0019
Rods, electrodes, materials, or media, for use in soldering, welding, or cutting: interlayers, transition pieces for metallurgical bonding of workpieces	B23K 35/001 and subgroups
Rods, electrodes, materials, or media, for use in soldering, welding, or cutting: sheets or foils for use in soldering or brazing	B23K 35/0233 and subgroup

Selection of soldering or welding materials proper	B23K 35/24 and subgroups

Special rules of classification

Although a pre-treated substrate with an internal layer (e.g. oxidised surface) that is joined is not seen as an interlayer for classification in C04B 37/00, the internal layer is seen as an interlayer for classification in C04B 2237/00.

Documents classified in C04B 38/0019 should normally also be classified in C04B 37/003, as most honeycombs are made from ceramic material.

Electrode and electrodes layers that are inserted between ceramic substrate layers are normally not seen as interlayer, since they normally do not have the function of joining the two ceramic substrates. They therefore do not receive a C04B 2237/12 code. Only if it is clear that the electrode does have a joining effect, it is regarded as interlayer, and C04B 2237/12 or a subgroup is allocated.

In the case of bonding through the use of pre-ceramic polymers, such as polycarbosilane, polysiloxane, polysilazane, as adhesive, C04B 37/008 is also attributed, since for bonding a polymeric adhesive is used. The ceramic interlayer formed through the bonding is coded with either C04B 2237/08 or C04B 2237/083.

C04B 37/008

{by means of an interlayer consisting of an organic adhesive, e.g. phenol resin or pitch}

Definition statement

This place covers:

The adhesive is normally a resin, but could also be tar, pitch. The bonding material in principle does not contain inorganic matter. Bonding through the use of pre-ceramic polymers, such as polycarbosilane, polysiloxane, polysilazane, as adhesive.

Relationships with other classification places

Adhesives; non-mechanical aspects of adhesive processes in general; adhesive processes not provided for elsewhere; use of materials as adhesives	C09J

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating a ceramic substrate with a preformed sheet-like element, using an adhesive layer	C04B 41/4503

Special rules of classification

In the case of bonding through the use of pre-ceramic polymers, such as polycarbosilane, polysiloxane, polysilazane, as adhesive, C04B 37/005 is also attributed, since after bonding a ceramic interlayer has been formed. This interlayer is classified with either C04B 2237/08 or C04B 2237/083.

The classes from the range C04B 35/63404-C04B 35/6365 can be used to indicate the polymer adhesive.

C04B 37/02

with metallic articles

Definition statement

This place covers:

Binding a ceramic substrate with a metallic substrate. All layers/objects based on metallic phases as well as ceramic layers/objects having a metallic binder (cermets) are regarded as metallic. If the layer/object has a continuous metallic phase, it is regarded as metallic, even if the amount of metal is as low as for instance 5 wt%.

References

Limiting references

This place does not cover:

A second metal layer/object that is joined to a first metal layer/object, which itself is joined to a ceramic layer/object. Only the first metal layer/object, that is joined directly or through an interlayer with the ceramic layer/object, is classified.	B32B 15/00 and subgroups (Layered products essentially comprising metal)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Manufacture of workpieces or articles from metallic powder characterised by the manner of compacting or sintering; Apparatus specially adapted therefore; Presses and furnaces	B22F 3/00 and subgroups
Manufacture of workpieces or articles from metallic powder characterised by the special shape of the product	B22F 5/00 and subgroups

C04B 37/021

{in a direct manner, e.g. direct copper bonding [DCB]}

Definition statement

This place covers:

Joining the two articles without the use of an interlayer. The surface of one or more of the articles to-be-joined can be treated, e.g. by cleaning or oxidising, leading to an oxidised surface, or can for instance be wetted, but no external layer is applied to any of the surfaces to-be-bonded.

Special rules of classification

In the case the direct bonding results in the in-situ formation of an interlayer, the interlayer is indicated with a symbol from C04B 2237/02-C04B 2237/16

C04B 37/023

{characterised by the interlayer used (C04B 37/028 takes precedence)}

Definition statement

This place covers:

A layer/coating is externally applied on at least one of the two substrates, or a foil or sheet is laid in between the two substrates. Bonding through the use of pre-ceramic polymers, such as polycarbosilane, polysiloxane, polysilazane, as adhesive.

References

Limiting references

This place does not cover:

The creation of an internal layer within the substrate before bonding, e.g. by oxidising the surface or otherwise treating the surface	C04B 37/021 (direct bonding of ceramic with metal)
Joining a ceramic article with a metal article though heating, using an adhesive	C04B 37/028

Informative references

Attention is drawn to the following places, which may be of interest for search:

Rods, electrodes, materials, or media, for use in soldering, welding, or cutting: interlayers, transition pieces for metallurgical bonding of workpieces	B23K 35/001 and subgroups

Special rules of classification

Although a pre-treated substrate with an internal layer (e.g. oxidised surface) that is joined is not seen as an interlayer for classification in C04B 37/00, the internal layer is seen as an interlayer for classification in C04B 2237/00.

In the case of bonding through the use of pre-ceramic polymers, such as polycarbosilane, polysiloxane, polysilazane, as adhesive, C04B 37/028 is also attributed, since for bonding a polymeric adhesive is used. The ceramic interlayer formed through the bonding is classified with either C04B 2237/08 or C04B 2237/083.

C04B 37/028

{by means of an interlayer consisting of an organic adhesive, e.g. phenol resin or pitch}

Definition statement

This place covers:

The adhesive is normally a resin, but could also be tar, pitch. The bonding material in principle does not contain inorganic matter. Bonding through the use of pre-ceramic polymers, such as polycarbosilane, polysiloxane, polysilazane, as adhesive.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating a ceramic substrate with a preformed sheet-like element, using an adhesive layer	C04B 41/4503

Special rules of classification

In the case of bonding through the use of pre-ceramic polymers, such as polycarbosilane, polysiloxane, polysilazane, as adhesive, C04B 37/005 is also attributed, since after bonding a ceramic interlayer has been formed. This interlayer is classified with either C04B 2237/08 or C04B 2237/083.

The classes from the range C04B 35/63404-C04B 35/6365 can be used to indicate the polymer adhesive.

C04B 37/04

with articles made from glass

Definition statement

This place covers:

joining a ceramic with a glass article or glass-ceramic article

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Layered products essentially comprising sheet glass, or glass, slag, or like fibres	B32B 17/00 and subgroups
Joining pieces of glass to pieces of other inorganic material; joining glass to glass other than by fusing	C03C 27/00 and subgroups

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Glass-ceramic	a crystallised glass or a mixture of glass particles and ceramic particles, in which the glass forms a continuous matrix phase

C04B 37/042

{in a direct manner}

Definition statement

This place covers:

Joining the two articles without the use of an interlayer. The surface of one or more of the articles to-be-joined can be treated, e.g. by cleaning or oxidising, leading to an oxidised surface, or can for instance be wetted, but no external layer is applied to any of the surfaces to-be-bonded.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Fusing glass directly to metal	C03C 27/02

Special rules of classification

In the case the direct bonding results in the in-situ formation of an interlayer, the interlayer is indicated with a symbol from C04B 2237/02-C04B 2237/16

C04B 37/045

{characterised by the interlayer used (C04B 37/047 takes precedence)}

Definition statement

This place covers:

A layer/coating is externally applied on at least one of the two substrates, or a foil or sheet is laid in between the two substrates. Bonding through the use of pre-ceramic polymers, such as polycarbosilane, polysiloxane, polysilazane, as adhesive.

References

Limiting references

This place does not cover:

Joining a ceramic article with a glass article though heating, using an adhesive	C04B 37/047

Informative references

Attention is drawn to the following places, which may be of interest for search:

Joining glass to metal by means of an interlayer	C03C 27/04 and subgroups
Joining glass to glass with the aid of intervening metal	C03C 27/08
Joining metals with the aid of glass	C03C 29/00

Special rules of classification

In the case of bonding through the use of pre-ceramic polymers, such as polycarbosilane, polysiloxane, polysilazane, as adhesive, C04B 37/047 is also attributed, since for bonding a polymeric adhesive is used. The ceramic interlayer formed through the bonding is classified with either C04B 2237/08 or C04B 2237/083.

C04B 37/047

{by means of an interlayer consisting of an organic adhesive, e.g. phenol resin or pitch}

Definition statement

This place covers:

The adhesive is normally a resin, but could also be tar, pitch. The bonding material in principle does not contain inorganic matter. Bonding through the use of pre-ceramic polymers, such as polycarbosilane, polysiloxane, polysilazane, as adhesive.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Joining glass to another inorganic material using an adhesive	C03C 27/048
Joining glass to glass using an adhesive	C03C 27/10

Special rules of classification

In the case of bonding through the use of pre-ceramic polymers, such as polycarbosilane, polysiloxane, polysilazane, as adhesive, C04B 37/005 is also attributed, since after bonding a ceramic interlayer has been formed. This interlayer is classified with either C04B 2237/08 or C04B 2237/083.

The classes from the range C04B 35/63404-C04B 35/6365 can be used to indicate the polymer adhesive.

C04B 38/00

Porous mortars, concrete, artificial stone or ceramic ware; Preparation thereof (treating slag with gases or gas generating material C04B 5/06; {expanded graphite C04B 35/536})

Definition statement

This place covers:

This part of C04B relates to porous or lightweight cement-, mortar-, concrete-, and artificial stone compositions and porous or lightweight ceramics.

Subdivision of C04B 38/00 is largely based on the methods used for obtaining the porosity or the reduction in weight.

e.g. melting ice;

e.g. by electrolysing;

e.g. expansion of air by reducing pressure takes C04B 40/0089 code in a C-set;

e.g. evaporation of solvent without expansion;

e.g. applying vacuum to draw gas out of gas permeable hollow particles

Relationships with other classification places

Porous or lightweight ceramics are always classified in C04B 38/00. When the ceramic composition and/or its precursors are described also in detail, classification is also made in C04B 33/00 or C04B 35/00.

- melting ice- classify also in C04B 40/0683 and/or C04B 38/061

References

Limiting references

This place does not cover:

Treating slag with gases or gas generating material to make porous slag	C04B 5/06;
Expanded graphite	C04B 35/536
Reaction sintered ceramics	C04B 35/64
Catalyst supports by co-precipitation	B01J 37/03;

Special rules of classification

Officially in main group C04B 38/00, there is no LPR. Nonetheless when porosity is obtained by a combination of methods, as a general rule, classification is made in the last appropriate place. Classification in two places can be made when all methods are considered to represent invention information. In the case of combination methods the method that provides simply additional information and is not identified by the classification is given as C04B symbol in the C-set. Other aspects of interest can identified further with C04B 38/00 symbols e.g. C04B 38/0054, C04B 38/0074.

The central idea for classification/C-set in C04B 38/00 is: classification according to the method and identifying the nature of the material that is made porous or lightweight by a symbol in the C-set. These symbols can be chosen from C04B 26/00 - C04B 35/00. For a stone substrate C04B 14/00 symbols are used.

C04B 38/0006

{Honeycomb structures (from one or more corrugated sheets by winding or stacking C04B 38/0083)}

References

Limiting references

This place does not cover:

Honeycomb structures from one or more corrugated sheets by winding or stacking	C04B 38/0083
Extrusion of honeycomb structures	B28B 2003/203

Informative references

Attention is drawn to the following places, which may be of interest for search:

Filters i.e. particle separators or filtering processes specially modified for separating dispersed particles from gases or vapours;	B01D 46/00
Honeycombs	B01D 46/2418
Honeycombs used for filtering exhaust gases of an internal combustion engine	F01N 3/022

C04B 38/0019

{characterised by the material used for joining separate subunits}

Special rules of classification

- The C04B 38/0019 set contains only information of the binder or the ceramic material of the adhesive

Example : (C04B 38/0019; C04B 28/24)

(C04B 38/0019; C04B 35/803)

- The honeycomb ceramic itself has to be given in a different set bearing class C04B 38/0006

e.g. (C04B 38/0006;C04B 35/565)

- additional class in C04B 28/24 (for above example) with symbols for the specific fillers /additives)

C04B 38/0022

{obtained by a chemical conversion or reaction other than those relating to the setting or hardening of cement-like material or to the formation of a sol or a gel, e.g. by carbonising or pyrolysing preformed cellular materials based on polymers, organo-metallic or organo-silicon precursors}

Definition statement

This place covers:

e.g. reaction sintering

C04B 38/0051

{characterised by the pore size, pore shape or kind of porosity}

Definition statement

This place covers:

e.g. microporous < 2 nm;

e.g. mesoporous 2-50 nm;

e.g. macroporous > 50 nm

C04B 38/009

{Porous or hollow ceramic granular materials, e.g. micro-balloons (C04B 18/027, C04B 20/002 take precedence)}

References

Limiting references

This place does not cover:

Use of expanded clay as fillers for mortars, concrete or artificial stone	C04B 14/12
Use of fired or melted materials as fillers for mortars, concrete or artificial stone	C04B 18/023,

Use of lightweight materials as fillers for mortars, concrete or artificial stone	C04B 18/027
Use of hollow or porous granular materials as fillers for mortars, concrete or artificial stone	C04B 20/002
Expanding clay, perlite, vermiculite or like granular materials as fillers for mortars, concrete or artificial stone	C04B 20/06
Coating or impregnating of particulate or fibrous ceramic material	C04B 41/4584
Catalysts characterised by their form, spheres	B01J 35/08

Special rules of classification

-Documents classified in this group receive further C-set symbols for the method of making the porosity

- takes precedence over C04B 38/02 or C04B 38/04

C04B 38/0096

{Pores with coated inner walls}

References

Limiting references

This place does not cover:

Preparing or treating the raw materials for obtaining porous material by burning out of a substance e.g. coating of burnable material to give coated pores	C04B 38/063
Physical aspects of the porous material obtained by burning out a substance	C04B 38/0695

C04B 38/02

by adding chemical blowing agents

Definition statement

This place covers:

Porous mortars, concrete, artificial stoneir ceramic ware prepared by the addition of blowing agents

e.g. foaming by evaporation of solvent (involves expansion);

e.g. foaming by evaporation of crystal water;

e.g. foaming by using Ca-carbide (+ water --> acetylene) or Si

References

Limiting references

This place does not cover:

Evaporation of solvent without expansion	C04B 38/00;
Porous or hollow ceramic granular materials	C04B 38/009

Special rules of classification

C04B 38/009 takes precedence

C04B 38/04

by dissolving-out added substances

Definition statement

This place covers:

Porous mortars, concrete, artificial stoneir ceramic ware prepared by dissolving-out added substances,

e.g. with gaseous HF or by etching

References

Limiting references

This place does not cover:

Porous or hollow ceramic granular materials	C04B 38/009

Special rules of classification

C04B 38/009 takes precedence

C04B 38/08

by adding porous substances

References

Limiting references

This place does not cover:

Porous or hollow ceramic granular materials	C04B 38/009

Special rules of classification

C04B 38/009 takes precedence

C04B 38/10

by using foaming agents (C04B 38/02 takes precedence){or by using mechanical means, e.g. adding preformed foam}

Definition statement

This place covers:

Porous mortars, concrete, artificial stoneir ceramic ware prepared by using foam agents or by using mechanical means

e.g. waterglass is a well-known deflocculant for these compositions;

e.g. with sulfate or sulfonate product

References

Limiting references

This place does not cover:

Porous or hollow ceramic granular materials	C04B 38/009
Porous mortars, concrete, artificial or ceramic ware prepared by adding chemical blowing agents	C04B 38/02
Foam producing agents	B01F 17/00

Special rules of classification

-C04B 38/009 takes precedence;

C04B 40/00

Processes, in general, for influencing or modifying the properties of mortars, concrete or artificial stone compositions, e.g. their setting or hardening ability (active ingredients C04B 22/00 - C04B 24/00; hardening of a well-defined composition C04B 26/00 - C04B 28/00; making porous, cellular or lightening C04B 38/00; mechanical aspects B28, e.g. conditioning the materials prior to shaping B28B 17/02)

Definition statement

This place covers:

C04B 40/00 and subgroups refer to processes occurring before the shaping of the composition

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Producing shaped mixtures containing cementitious materials	B28B;
Producing mixtures containing cementitious materials	B28C;
Mixing in general	B29B 7/00

Special rules of classification

Documents are classified in these groups when the preparation or characteristics of the mixture are the main aspect of the invention. If the mixture as such or its ingredients are considered new or unusual, classification is made for these aspects too in C04B 22/00-C04B 32/00. Process steps that are not the main aspect of the invention are classified as part of the C-set of a mixture using entries from C04B 40/00

C04B 40/0014

{Microwaves}

Special rules of classification

C04B 40/0082, C04B 40/0263 contain older documents

C04B 40/0028

{Aspects relating to the mixing step of the mortar preparation}

Definition statement

This place covers:

This class is used as classification or in a C-set to indicate the importance of the mixing steps or the sequence of mixing steps

- e.g. dry mixing, later adding water or aqueous solution;

e.g. first organic solvent , then water ;

e.g. granulated mortar compacted in mould

Special rules of classification

The presence of a C04B 28/00 or C04B 26/00 symbol in the C-set indicates that the premixture is intended for use with mineral or organic binder systems.

C04B 40/0032

{Controlling the process of mixing, e.g. adding ingredients in a quantity depending on a measured or desired value (B28C 7/00 takes precedence)}

Special rules of classification

B28C 7/00 takes precedence:

C04B 40/0039

{Premixtures of ingredients}

References

Limiting references

This place does not cover:

sequence of mixing steps	C04B 40/0028

Special rules of classification

This class is used as the main classification entry when the invention relates to an active ingredient that is a mixture on its own. The specific ingredients that are part of the mixture are classified in the C-set

C04B 40/005

{High shear mixing; Obtaining macro-defect free materials}

Definition statement

This place covers:

High shear mixing of the mortar preparation

Processes for obtaining macro-defect free materials

e.g. MDF = macro-defect free

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

MDF	C04B 2111/00301 (symbol added)

Synonyms and Keywords

In patent documents the following abbreviations are often used:

"Hohe Schwerwirkung";

"a haut cisaillement";

C04B 40/0092

{Temporary binders, mortars or concrete, i.e. materials intended to be destroyed or removed after hardening, e.g. by acid dissolution}

Definition statement

This place covers:

Provisional binders, mortars or concrete used in the processes for influencing or modifying the properties of mortars, concrete or artificial stone compositions

e.g. processes resulting in concretes with decreasing mechanical properties

C04B 40/0096

{Provisions for indicating condition of the compositions or the final products, e.g. degree of homogeneous mixing, degree of wear}

References

Limiting references

This place does not cover:

Control of cementation level in oil wells	E21B 47/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Investigating or analysing concrete by specific methods	G01N 33/38

C04B 40/02

Selection of the hardening environment

Definition statement

This place covers:

C04B 40/02 and subgroups refer to processes occurring after the shaping / moulding of the composition that concern hardening, setting, pre-curing and curing

Special rules of classification

See rules under C04B 40/00

C04B 40/024

{Steam hardening, e.g. in an autoclave}

Definition statement

This place covers:

Steam hardening of mortars, concrete or artificial stone compositions

e.g. mostly used for "sand-lime" mixtures and/or lightweight concrete

C04B 40/0263

{Hardening promoted by a rise in temperature (C04B 40/024 takes precedence)}

Special rules of classification

- C04B 40/0204 takes precedence

C04B 40/0277

{Hardening promoted by using additional water, e.g. by spraying water on the green concrete element (steam hardening C04B 40/024)}

Special rules of classification

- C04B 40/024 takes precedence

C04B 40/04

Preventing evaporation of the mixing water (permanent coverings C04B 41/00)

References

Limiting references

This place does not cover:

Protecting building materials against unfavourable weather influence	E04G 21/28

C04B 40/06

Inhibiting the setting, e.g. mortars of the deferred action type containing water in breakable containers; {Inhibiting the action of active ingredients}

Definition statement

This place covers:

Inhibiting the setting, inhibiting the action of active ingredients of mortars, concrete or artificial stone compositions

e.g. coating cements with retarder

References

Limiting references

This place does not cover:

Coating cement powders with retarder	C04B 20/10
Anchoring	B28B 1/521, E02D 5/80, E21D 20/00
Encapsulated ingredients for macromolecular compositions	C08K 9/10;

C04B 40/0608

{Dry ready-made mixtures, e.g. mortars at which only water or a water solution has to be added before use}

Definition statement

This place covers:

Inhibiting the setting with dry ready-made mixture,

factory made dry mixtures of sands, binders and additives, transported in containers or sacks to the place of use where water is added to make them workable

Synonyms and Keywords

In patent documents the following abbreviations are often used:

"Trockenmörtel";

"mortier sec";

C04B 40/0666

{Chemical plugs based on hydraulic hardening materials}

References

Limiting references

This place does not cover:

Chemical plugs in general	F16B 13/142

C04B 40/0683

{inhibiting by freezing or cooling}

Definition statement

This place covers:

Inhibiting the setting by freezing or cooling,

e.g. by adding snow or ice

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

creating porosity by melting ice	C04B 38/00 symbol added ;
creating porosity by melting out added substances	C04B 38/061

C04B 41/00

After-treatment of mortars, concrete, artificial stone or ceramics; Treatment of natural stone (conditioning of the materials prior to shaping C04B 40/00; applying liquids or other fluent materials to surfaces, in general B05; grinding or polishing B24; apparatus or processes for treating or working shaped articles of clay or other ceramic compositions, slag or mixtures containing cementitious material B28B 11/00; working stone or stone-like materials B28D; glazes, other than cold glazes, C03C 8/00; etching, surface-brightening or pickling compositions C09K 13/00)

Definition statement

This place covers:

After-treatment of materials covered by C04B, i.e. artificial stones, mortars, concrete and ceramics, e.g. coating of impregnation of green concrete or unsintered ceramics after primary shaping.

Non-mechanical treatment of natural stone.

Relationships with other classification places

While other kinds of after-treatment are not excluded, C04B 41/00 relate to after- treatment of substrate, mainly to :

- coating or impregnation of the substrates: C04B 41/45 and subgroups

- removing material from the substrates: C04B 41/53 and subgroups.

In main group C04B 41/00, no distinction is made between coating or impregnation. Therefore, the terms coating, impregnation and layer are considered equivalent.

References

Limiting references

This place does not cover:

Coating of fillers for mortars, concrete or artificial stone	C04B 20/10
Infiltration with silicon resulting in reaction bonded silicon carbide	C04B 35/573
Coating of ceramic fibres or powders used in the manufacture of monolithic ceramics	C04B 35/628
Impregnation processes, which lead to fibre-reinforced composites with ceramic matrix	C04B 35/80
Removal of material by burning out added substances	C04B 38/06
Working by laser beam	B23K 26/00
Glazes other than cold glazes	C03C
Coating of class-ceramics	C03C 17/00
Pigments	C09C 1/0009
Ceramic compositions containing free metal bonded to carbides, diamond, oxides, borides, nitrides, silicides, e.g. cermets, or other metal compounds, e.g. oxynitrides or sulfides, other than macroscopic reinforcing agents	C22C
Infiltration of preforms containing free metal, e.g. cermets	C22C
After-treatment of materials containing free metal bonded to carbides, diamond, oxides, borides, nitrides, silicides, e.g. cermets, other than as macroscopic reinforcing agents	C23C
After-treatment of single crystals, e.g. silicon wafers	C30B, H01L
Drying by electro-osmosis	E04B 1/7007
Etching of semiconductor bodies	H01L 21/306

Informative references

Attention is drawn to the following places, which may be of interest for search:

Conditioning of the materials prior to shaping	C04B 40/00
Preparations for dentistry	A61K 6/00
Prostheses	A61L
Filters, membranes	B01D
Catalysts	B01J
Applying liquids or other fluent materials to surfaces in general	B05
Grinding or polishing	B24
Impregnating wood	B27K 3/00
Apparatus or processes for treating or working shaped articles of clay or other ceramic compositions, slag or mixtures containing cementitious material	B28B 11/00
Working stone or stone-like materials	B28D
Layered products	B32B
Producing decorative effects by removing surface material	B44C 1/22

Surface treatment of glass	C03C 17/00
Coating compositions	C09D
Etching, surface-brightening or pickling compositions	C09K 13/00
Covering materials with metals in general	C23C
Thermal spraying	C23C 4/00
Coating by vacuum evaporation of the coating material, e.g. sputtering	C23C 14/00
Chemical vapour deposition	C23C 16/00
Chemical coating by decomposition of either liquid compounds or solutions of the coating forming compounds, e.g. sol-gel processing	C23C 18/00
Anodic or cathodic protection	C23F 13/02
After-treatment of single crystals	C30B 33/00
Building materials	E04C
Gas turbines	F01D
Filters for internal combustion engines	F01N 3/0222
Friction materials	F16D 69/02
Processes of apparatus for the manufacture of semiconductor devices	H01L 21/00
Fuel cells	H01M 8/00

Special rules of classification

In this group the C-set system is used. See details under C04B

In group C04B 41/45 and subgroups, as a general rule, classification is made according to the end products present in the coating. However, in C04B 41/49 and subgroups classification is made according to the nature of the starting materials in the coating composition.

- As a general rule subdivision of main group C04B 41/00 is based on aspects relating to the method of after-treatment, such as the selection of the method for applying the coating material on the substrate, e.g. by CVD (C04B 41/4531) or the selection of the coating or impregnation material with which the substrate is treated, e.g. coating with carbon (C04B 41/5001).

For further classifying only the range C04B 41/00 - C04B 41/5392 is used . Documents classified in the range C04B 41/60 - C04B 41/91 always get also a class in C04B 41/00 - C04B 41/5392, which may be combined with one or more C-sets.

- To identify the substrate that is after-treated, the class C04B 41/009 is given and C-sets are created using complementary codes chosen from:

- C04B 14/02 - C04B 14/36 when natural stone is treated

- C04B 26/00 - C04B 32/005 when artificial stone, e.g. concrete is treated

- C04B 33/00 - C04B 35/83 when ceramics are treated

- C04B 38/00 - C04B 38/106 when porous materials are treated

- C04B 14/38 - C04B 14/48 when ceramic fibres are treated, i.e. only when classifying in C04B 41/4584.

When the substrate is further defined e.g. a wood fiber/particle board, which in itself is information that does not require classification in the substrate class itself e.g. C04B 28/02, then the C04B 41/009 set will be:

C04B 41/009,C04B 18/26,C04B 28/02

If a class in C04B 28/00 is also required because the mixture per se is interesting and is part of the invention information, then the C04B 41/009 set will comprise only the C04B 28/02 symbol.

- When the same substrate is coated with two or more layers, classification is made in C04B 41/52. If one of the layers as such might be new in the field, classification for this layer as such is made too.

For each layer a separate C-set is made, each starting with C04B 41/52, the first set relating to the first layer, the second set relating to the second layer etc.

- When, in the case of multiple coating, alternatives are mentioned, the following procedure is followed.

If, e.g. for layer 2 an alternative is to be identified, the third C-set will represent this alternative layer, with at the end the code C04B 41/522. [This symbol is not to be used for classification.] So in this case, a possible third layer will be identified by the fourth C-set, because the third one refers to an alternative of the second layer (represented by the second set).

- For the sake of classification/indexing in C04B, treatment of "green" concrete or ceramics, i.e. concrete that has not hardened yet, resp. ceramic products that are not fired yet, is considered to be covered by C04B 41/00. Such documents will receive C04B 41/4578 as an extra code in the C-set. Only in exceptional cases, classification can be made in this group.
- Group C04B 41/53 relates to the removal of part of the materials of the treated article. A coating process including a step like polishing, roughening or etching is however not classified in C04B 41/53 or a subgroup (what could be expected applying the last place rule), but is classified applying the general rules for coatings above and adding C04B 41/53 or a subgroup to the C-set. If however the removal is the essential step of the invention, classification in C04B 41/53 is (also) made.
- In the same way as when classifying in the other parts of C04B, mentioned above, symbols of the series C04B 2111/00 can be used to identify uses or characteristics of the products obtained.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Green ceramics	unsintered ceramics

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

Physical vapour deposition	PVD
Chemical vapour deposition	CVD

C04B 2103/00

Function or property of ingredients for mortars, concrete or artificial stone

Special rules of classification

This scheme is associated mainly with groups C04B 22/00 - C04B 24/00, but also other C04B groups and is used to indicate the function or property of the (active) ingredients. When used in a C-set it shows the presence of an ingredient characterised by its function.

example :

C04B 28/04%; C04B 18/08; C04B 18/141; C04B 18/16; C04B 2103/12; C04B 2103/302; C04B 2103/46

When used as the base class of a C-set followed by a number of C04B symbols, it shows that all these symbols represent alternative ingredients having the same function.

example :

C04B 2103/12; C04B 22/0093; C04B 24/04; C04B 24/121

C04B 2111/00

Mortars, concrete or artificial stone or mixtures to prepare them, characterised by specific function, property or use

Special rules of classification

This scheme is associated mainly with groups C04B 26/00 - C04B 32/00, C04B 38/00 and C04B 41/00 and is used to indicate the function, property or use of the mortar, concrete, artificial stone or porous material.

C04B 2201/00

Mortars, concrete or artificial stone characterised by specific physical values

Special rules of classification

This scheme is associated mainly with groups C04B 26/00 - C04B 32/00, C04B 38/00 or C04B 41/00 and is used to indicate mortars, concrete or artificial stone characterised by specific physical values

C04B 2235/00

Aspects relating to ceramic starting mixtures or sintered ceramic products

Definition statement

This place covers:

Additional aspects that cannot be indicated with CPC groups regarding the starting materials for making a ceramic, the methods of shaping a green ceramic, the heat treatments that are given to green, melted or already sintered ceramics, aspects that regard the sintered ceramic, it's properties, it's use.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Clay materials	C04B 33/00 and sub-classes
Ceramic materials	C04B 35/00 and sub-classes
joining of a ceramic layer to another layer	C04B 37/00 and sub-classes
porous ceramic products	C04B 38/00
Aspects relating to ceramic laminates or to joining of ceramic articles with other articles by heating	C04B 2237/00 and sub-codes
Layered products essentially comprising ceramics , e.g. refractory products	B32B 18/00

Special rules of classification

The symbols from the C04B 2235/00-scheme are meant mainly for the fields C04B 33/00 and C04B 35/00, but can also be used for the fields B32B 18/00 and C04B 37/00.

C04B 2235/02

Composition of constituents of the starting material or of secondary phases of the final product

Definition statement

This place covers:

The aspects relate either to the starting materials that can be used for making a ceramic or to the secondary phases of ceramic objects.

References

Limiting references

This place does not cover:

Aspects relating to the preparation, properties or mechanical treatment of green bodies or pre-forms	C04B 2235/60 and subgroups
Aspects relating to heat treatment of ceramic bodies such as green ceramics or pre-sintered ceramics, e.g. burning, sintering or melting processes	C04B 2235/65 and subgroups
Aspects relating to sintered or melt-casted ceramic products, other than the specific secondary phases that are present	C04B 2235/70 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on oxide ceramics	C04B 35/01 and subgroups
Additives to cement, concrete, mortar or artificial stone, characterised by their function, e.g. dispersant, oxidising agent, pigment	C04B 2103/00 and subgroups

C04B 2235/30

Constituents and secondary phases not being of a fibrous nature

Definition statement

This place covers:

The starting materials are defined by their chemical composition, and can be a powder, suspension, solution, but not a fiber. The secondary phases of the shaped ceramics are also defined by their composition and can have any grain size or shape.

References

Limiting references

This place does not cover:

Coatings around inorganic particles that are used as starting material for making a ceramic	C04B 35/62802 and subgroups
Binders based on phosphoric acid or phosphates	C04B 35/6306 and subgroups
Polymer additives	C04B 35/634 and subgroups
Polysaccharide additives	C04B 35/636 and subgroups
Constituents or additives of the starting mixture chosen for their shape or used because of their shape or their physical appearance	C04B 2235/50 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Inorganic additives for clay mixtures	C04B 33/131
Products characterised by the absence or the low content of specific components, e.g. alkali metal free alumina ceramics	C04B 2235/72 and subgroups
Ceramic interlayer used for joining a ceramic with another substrate	C04B 2237/04 and subgroups
Ceramic substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/32 and subgroups

C04B 2235/32

Metal oxides, mixed metal oxides, or oxide-forming salts thereof, e.g. carbonates, nitrates, (oxy)hydroxides, chlorides

Definition statement

This place covers:

All metal oxides or metal salts that convert to oxide upon heating, used as starting material for making a ceramic or present as secondary phase in a sintered ceramic.

References

Limiting references

This place does not cover:

Glass, asbestos or fused silica fibers added to a ceramic	C04B 35/82
Non-metal oxide starting material or secondary phase, e.g. silica, silicates, boron oxide	C04B 2235/34 and subgroups
Metal oxide starting material or secondary phase present in a glass phase	C04B 2235/36 and subgroup
Metal salt constituents or additives chosen for the nature of the anions, e.g. hydrides or acetylacetonate	C04B 2235/44 and subgroups

Oxide fibers added to ceramics	C04B 2235/522 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on beryllium oxide	C04B 35/08
Ceramics based on actinide oxides, e.g. uranium or plutonium oxides	C04B 35/51
Inorganic additives used for making ceramics	C04B 35/6303 and subgroups
Non-oxide ceramic constituents or additives, non-oxide phases present as secondary phase in a sintered ceramic	C04B 2235/38 and subgroups
Metallic constituents or additives not added as binding phase, or present as secondary phase in a sintered ceramic	C04B 2235/40 and subgroups
Non metallic elements added as constituents or additives, or present as secondary phase in a sintered ceramic, e.g. silicon, boron, carbon, sulphur, phosphor, selenium or tellurium	C04B 2235/42 and subgroups
Products characterised by the absence or the low content of specific components, e.g. alkali metal free alumina ceramics	C04B 2235/72 and subgroups
Oxide interlayer used for joining a ceramic with another substrate	C04B 2237/06 and subgroups
Oxide substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/34 and subgroups
Oxides used as filler for polymers	C08K 3/20 and subgroup

Special rules of classification

The C04B 35/6303 class and sub-classes are in praxis only used for inorganic binders, not for all inorganic additives.

The code C04B 2235/32 is given only to the actinide oxides (e.g. uranium, plutonium, thorium). Arsenic oxide, selenium oxide and tellurium oxide receive C04B 2235/34, since Ar, Se and Te are not metals.

If certain metal salts are used, the metal salt can be classified with a C04B 2235/32 symbol for the cation and a C04B 2235/44 symbol for the anion. Cations present in mixed oxide additives are also individually classified, e.g. if a magnesium ferrite is used as starting powder, both C04B 2235/3274 for the ferrite and C04B 2235/3206 for the MgO are added. If barium titanate is used as additive, both C04B 2235/3236 for alkaline earth titanate additives and C04B 2235/3215 for barium salt or oxide additives are used. This also accounts for additives from the C04B 2235/34 range. If for instance an alkali silicate is used as additive, both C04B 2235/3427 and C04B 2235/3201 are given.

The C04B 2235/32 and C04B 2235/34 are not combined with the C04B 2235/38 or C04B 2235/40 symbols for one and the same additive. If for instance magnesium nitride is added, just C04B 2235/3852 is used, but not C04B 2235/3206. A mixed non-oxide such as aluminium silicon carbide will be classified with C04B 2235/3826 for the silicon carbide and C04B 2235/3817 for the aluminium carbide. If a non-oxide additive is made starting from a metal salt, however, for instance titanium boride additive is first made from titanium acetate and boron, then not only the boride symbol, C04B 2235/3813, but also the symbols for the first starting materials are given, thus C04B 2235/3232 for the Ti-salt, C04B 2235/421 for the boron and C04B 2235/449 for the acetate.

C04B 2235/3201

Alkali metal oxides or oxide-forming salts thereof

Definition statement

This place covers:

Alkali metal oxides, e.g. Na_2O, K_2O, alkali metal containing mixed oxides, e.g. sodium niobate ($NaNbO_3$), alkali metal oxide containing clay, alkaline metal oxide containing silicates, e.g. sodium feldspar ($NaAlSi_3O_8$) or waterglass (Na_2SiO_3), alkali metal salts, e.g. potassium chloride (K_2Cl), alkali metal containing salts, all used as starting material for making ceramics.

Alkali metal oxide containing secondary phases of sintered ceramic, e.g. K_2O or Na_2O containing mixed oxides, e.g. potassium tantalate ($KTaO_3$).

Relationships with other classification places

compounds of alkali metals, i.e. lithium, sodium, potassium, rubidium, caesium, or francium C01D

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on beta alumina (normally contains alkali oxides)	C04B 35/113
Alkali metal aluminosilicates based ceramics	C04B 35/19
Compositions containing one or more ferrites of the group comprising manganese, zinc, nickel, copper or cobalt and one or more ferrites of the group comprising rare earth metals, alkali metals, alkaline earth metals or lead	C04B 35/2608 and subgroups
Compositions containing one or more ferrites of the group comprising rare earth metals and one or more of the group comprising alkali metals, alkaline earth metals or lead	C04B 35/2641
Other ferrites containing alkali metals	C04B 35/2691
Alkali metal phosphate added as binder	C04B 35/6313
Alkali aluminate starting material or secondary phase	C04B 2235/3222, C04B 2235/3201
Alkali titanate starting material or secondary phase	C04B 2235/3234, C04B 2235/3201
Alkali chromate starting material or secondary phase	C04B 2235/3243, C04B 2235/3201
Alkali zirconate starting material or secondary phase	C04B 2235/3248, C04B 2235/3201
Alkali niobate starting material or secondary phase	C04B 2235/3255, C04B 2235/3201
Alkali molybdate starting material or secondary phase	C04B 2235/3256, C04B 2235/3201
Alkali manganate starting material or secondary phase	C04B 2235/3268, C04B 2235/3201
Alkali ferrite starting material or secondary phase	C04B 2235/3274, C04B 2235/3201

Alkali cobaltate starting material or secondary phase	C04B 2235/3275, C04B 2235/3201
Alkali cuprate starting material or secondary phase	C04B 2235/3282, C04B 2235/3201
Alkali zincate starting material or secondary phase	C04B 2235/3284, C04B 2235/3201
Alkali stannate starting material or secondary phase	C04B 2235/3293, C04B 2235/3201
Alkali bismuthate starting material or secondary phase	C04B 2235/3298, C04B 2235/3201
Alkali borate starting material or secondary phase	C04B 2235/3409, C04B 2235/3201
Alkali silicate starting material or secondary phase	C04B 2235/3427, C04B 2235/3201
Alkali alumino-silicate starting material or secondary phase	C04B 2235/3472, C04B 2235/3201
Alkali glass starting material or secondary phase	C04B 2235/36
Alkali nitride starting material or secondary phase	C04B 2235/3852
Alkali hydroxide starting material	C04B 2235/44, C04B 2235/3201
Alkali iodide starting material	C04B 2235/444, C04B 2235/3201
Alkali sulphide starting material	C04B 2235/446, C04B 2235/3201

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Alkali metal oxides	lithium (Li), sodium (Na), potassium (K), rubidium (Rb), cesium (Cs), francium (Fr)

C04B 2235/3203

Lithium oxide or oxide-forming salts thereof

Definition statement

This place covers:

Lithium oxide, Li_2O, lithium containing mixed oxides, e.g. lithium niobate ($LiNbO_3$), lithium oxide containing clay, lithium oxide containing silicates, e.g. spodumene($LiAl(SiO_3)_2$), lithium salts, e.g. lithium bromide (Li_2Br) or lithium hydroxide (LiOH), lithium containing salts, all used as starting material for making ceramics.

Lithium oxide containing secondary phases of a sintered ceramic, Li_2O or Li_2O containing mixed oxides, e.g. lithium titanate ($LiTiO_3$).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Compositions containing one or more ferrites of the group comprising manganese, zinc, nickel, copper or cobalt and lithium	C04B 35/2616
Lithium aluminate ($LiAlO_2$) starting material or secondary phase	C04B 2235/3222, C04B 2235/3203
Lithium gallate ($LiGaO_2$) starting material or secondary phase	C04B 2235/3286, C04B 2235/3203
Preparation of lithium salts, e.g. oxides, nitrates, sulphates	C01D 15/00 and subgroups

C04B 2235/3205

Alkaline earth oxides or oxide forming salts thereof, e.g. beryllium oxide

Definition statement

This place covers:

Alkaline earth metal oxides, e.g. BeO, MgO, RaO, alkaline earth metal containing mixed oxides, e.g. calcium zirconate ($CaZrO_3$), alkaline earth oxide containing clay, alkaline earth oxide containing silicates, e.g. wollastonite ($CaSiO_3$), alkaline earth salts, e.g. barium carbonate ($BaCO_3$), alkaline earth metal containing salts, all used as starting material for making ceramics.

Alkaline earth metal oxide containing secondary phases of sintered ceramic, e.g. SrO or alkaline earth metal oxide containing mixed oxides, e.g. barium titanate ($BaTiO_3$.)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Obtaining lime, magnesia or dolomite	C04B 2/00 and subgroups
Alkaline earth metal alumino-silicate based ceramics	C04B 35/195
Compositions containing one or more ferrites of the group comprising manganese, zinc, nickel, copper or cobalt and one or more ferrites of the group comprising rare earth metals, alkali metals, alkaline earth metals or lead	C04B 35/2608 and subgroups
Compositions containing one or more ferrites of the group comprising rare earth metals and one or more of the group comprising alkali metals, alkaline earth metals or lead	C04B 35/2641
Other ferrites containing alkaline earth metals or lead	C04B 35/2683
Ceramics based on alkaline earth titanates	C04B 35/465 and subgroups
Alkaline earth metal phosphate added as binder	C04B 35/6313
Alkaline earth aluminate starting material or secondary phase	C04B 2235/3222, C04B 2235/3205
Alkaline earth titanate starting material or secondary phase	C04B 2235/3236, C04B 2235/3205

Alkaline earth chromate starting material or secondary phase	C04B 2235/3243, C04B 2235/3205
Alkaline earth zirconate starting material or secondary phase	C04B 2235/3248, C04B 2235/3205
Alkaline earth niobate starting material or secondary phase	C04B 2235/3255, C04B 2235/3205
Alkaline earth molybdate starting material or secondary phase	C04B 2235/3256, C04B 2235/3205
Alkaline earth manganate starting material or secondary phase	C04B 2235/3268, C04B 2235/3205
Alkaline earth ferrite starting material or secondary phase	C04B 2235/3274, C04B 2235/3205
Alkaline earth cobaltate starting material or secondary phase	C04B 2235/3275, C04B 2235/3205
Alkaline earth cuprate starting material or secondary phase	C04B 2235/3282, C04B 2235/3205
Alkaline earth zincate starting material or secondary phase	C04B 2235/3284, C04B 2235/3205
Alkaline earth stannate starting material or secondary phase	C04B 2235/3293, C04B 2235/3205
Alkaline earth bismuthate starting material or secondary phase	C04B 2235/3298, C04B 2235/3205
Alkaline earth borate starting material or secondary phase	C04B 2235/3409, C04B 2235/3205
Alkaline earth silicate starting material or secondary phase	C04B 2235/3436, C04B 2235/3205
Alkaline earth alumino-silicate starting material or secondary phase	C04B 2235/3481, C04B 2235/3205
Alkaline earth glass starting material or secondary phase	C04B 2235/36
Alkaline earth carbide starting material or secondary phase	C04B 2235/3817
Alkaline earth metal starting material or secondary phase	C04B 2235/401
Alkaline earth hydroxide starting material	C04B 2235/44, C04B 2235/3205
Alkaline earth bromide starting material	C04B 2235/444, C04B 2235/3205
Alkaline earth sulphate starting material	C04B 2235/448, C04B 2235/3205
Alkaline earth oxalate starting material	C04B 2235/449, C04B 2235/3205
treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: compounds of alkaline earth metals or magnesium	C09C 1/02, C09C 1/02 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing inorganic alkaline earth metal compounds	C09K 11/0816, C09K 11/55

Special rules of classification

The symbol C04B 2235/3205 is used only for BeO, and RaO and in the case alkaline earth metal oxides are used without specifying which. As soon as one of MgO, CaO, SrO or BaO is mentioned, the respective symbol is used. Also if all 4 are mentioned, all 4 symbols are used, not C04B 2235/3205.

C04B 2235/3206

Magnesium oxides or oxide-forming salts thereof

Definition statement

This place covers:

MgO, MgO containing mixed oxides, e.g. spinel ($MgAl_2O_4$), Mg containing clay, MgO containing silicates, e.g. cordierite ($Mg_2Al_4Si_5O_{18}$), Mg salts, e.g. magnesium carbonate ($MgCO_3$), Mg containing salts, e.g. magnesium calcium nitrate ($Mg_{0.5}Ca_{0.5}NO_3$), all used as starting material for making ceramics.

MgO containing secondary phases of sintered ceramic, e.g. MgO or MgO containing mixed oxides, e.g. forsterite (Mg_2SiO_4)

References

Limiting references

This place does not cover:

MgO containing glass additive for making ceramics	C04B 2235/36
Mg containing non-oxide additives for making ceramics, e.g. magnesium boride, magnesium nitride	C04B 2235/38 and subgroups
Metallic Mg used as additive for making ceramics	C04B 2235/401
MgO containing fiber additives for making ceramics	C04B 2235/522

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: magnesia	C04B 14/304
Use of inorganic materials as active ingredients for mortars, concrete or artificial stone: Magnesia; Magnesium hydroxide	C04B 22/066
Magnesium oxide or magnesium carbonate cements	C04B 28/105, C04B 28/30 and subgroup
Ceramics based on magnesium oxide	C04B 35/04 and subgroups
Ceramics based on oxide mixtures derived from dolomite (containing both CaO and MgO)	C04B 35/06
Mixed oxides of MgO with both alumina and silica, e.g. cordierite	C04B 35/195
Mixed oxides of MgO with silica without alumina, e.g. forsterite (Mg_2SiO_4)	C04B 35/20
Compositions containing one or more ferrites of the group comprising manganese, zinc, nickel, copper or cobalt and magnesium	C04B 35/2625

Mixed oxides of MgO with iron oxides, e.g. ferrites	C04B 35/2683
Mixed oxides of MgO with chromium oxide, e.g. chromites	C04B 35/42
Mixed oxides of MgO with alumina, without silica, e.g. magnesium aluminate, spinel	C04B 35/443
Magnesium based phosphates	C04B 35/447
Mixed oxides of MgO with copper oxide, e.g. cuprates	C04B 35/45 and subgroups
Mixed oxides of MgO with zinc oxide and/or bismuth oxide, e.g. magnesium bismuthate	C04B 35/453
Mixed oxides of MgO with tin oxide, e.g. magnesium stannate	C04B 35/457
Mixed oxides of MgO with titanium oxides, such as magnesium titanate	C04B 35/465
Mixed oxides of MgO with zirconium oxide, e.g. magnesium zirconate	C04B 35/48 and subgroups
Mixed oxides of MgO with zirconium oxide and titanium oxide, e.g. magnesium titanate zirconate ($MgTi_{0.5}Zr_{0.5}O_3$)	C04B 35/49 and subgroups
Mixed oxides of MgO with vanadium oxide and/or niobium oxide and/ or molybdenum oxide and/or tungsten oxide and/or tantalum oxide, e.g. magnesium tantalum niobate ($MgNb_{0.5}Ta_{0.5}O_3$)	C04B 35/495 and subgroups
Making fibres based on magnesium oxide	C04B 35/62263
Coating or impregnating ceramic substrates with magnesium oxide	C04B 41/5029, C04B 41/5084 (cementitious)
Spinel starting material or secondary phase	C04B 2235/3222, C04B 2235/3206
Sr and Mg doped lanthanum gallate ($(La_{0.90}Sr_{0.10}Ga_{0.80}Mg_{0.2})O_3$ starting material or secondary phase	C04B 2235/3286, C04B 2235/3206, C04B 2235/3213, C04B 2235/3227 (La)
Magnesium silicate starting material or secondary phase	C04B 2235/3445, C04B 2235/3206
Magnesium alumino-silicate starting material or secondary phase	C04B 2235/3481, C04B 2235/3206
Magnesium boride starting material or secondary phase	C04B 2235/3808
Magnesium starting material or secondary phase	C04B 2235/401
Magnesium phosphate starting material or secondary phase	C04B 2235/447, C04B 2235/3206
Materials for prostheses based on magnesia or magnesium oxide	A61F 2310/00197
Catalysts comprising the elements, oxides, or hydroxides of magnesium	B01J 21/10, B01J 21/10, C07C 2521/10
Preparation of magnesium compound powders, e.g. magnesium oxide powder	C01F 5/00 and subgroups
treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: compounds containing only magnesium as metal	C09C 1/028, C09C 1/028

C04B 2235/3208

Calcium oxide or oxide-forming salts thereof, e.g. lime

Definition statement

This place covers:

CaO, CaO containing mixed oxides, e.g. calcium zirconate ($CaZrO_3$), CaO containing clay, calcium oxide containing silicates, e.g. wollastonite ($CaSiO_3$), calcium salts, e.g. calcium carbonate ($CaCO_3$), calcium containing salts, all used as starting material for making ceramics.

Calcium oxide containing secondary phases of sintered ceramic, e.g. CaO or calcium oxide containing mixed oxides, e.g. calcium alumino ferrite ($Ca_2(Al,Fe)_2O_5$).

References

Limiting references

This place does not cover:

Rendering lime in clay mixtures harmless	C04B 33/06

Informative references

Attention is drawn to the following places, which may be of interest for search:

Hydraulic lime	C04B 28/12
Eliminating lime or iron from clay mixtures	C04B 33/10
Ceramics based on calcium oxide	C04B 35/057
Ceramics based on oxide mixtures derived from dolomite (containing both CaO and MgO)	C04B 35/06
Mixed oxides of CaO with both alumina and silica, e.g. cordierite	C04B 35/195
Mixed oxides of CaO with silica without alumina, e.g. wollastonite ($CaSiO_4$)	C04B 35/22
Compositions containing one or more ferrites of the group comprising manganese, zinc, nickel, copper or cobalt and calcium, strontium or barium	C04B 35/2633
Mixed oxides of CaO with chromium oxide, e.g. chromites	C04B 35/42
Mixed oxides of CaO with alumina, without silica, e.g. calcium aluminate	C04B 35/44
Calcium based phosphates	C04B 35/447
Mixed oxides of CaO with copper oxide, e.g. cuprates	C04B 35/45 and subgroups
Mixed oxides of CaO with zinc oxide and/or bismuth oxide, e.g. calcium bismuthate	C04B 35/453
Mixed oxides of CaO with tin oxide, e.g. calcium stannate	C04B 35/457
Mixed oxides of CaO with titanium oxides, such as calcium titanate	C04B 35/465
Mixed oxides of CaO with zirconium oxide, e.g. calcium zirconate	C04B 35/48 and subgroups
Mixed oxides of CaO with zirconium oxide and titanium oxide, e.g. calcium titanate zirconate ($CaTi_{0.5}Zr_{0.5}O_3$)	C04B 35/49 and subgroups

Mixed oxides of CaO with vanadium oxide and/or niobium oxide and/ or molybdenum oxide and/or tungsten oxide and/or tantalum oxide, e.g. calcium tantalum niobate ($CaNb_{0.5}Ta_{0.5}O_3$)	C04B 35/495 and subgroups
Calcium zirconate starting material or secondary phase	C04B 2235/3248, C04B 2235/3208
Calcium silicate starting material or secondary phase	C04B 2235/3454, C04B 2235/3208
Calcium alumino-silicate starting material or secondary phase	C04B 2235/3481, C04B 2235/3208
Calcium nitride starting material or secondary phase	C04B 2235/3852
Calcium ethoxide starting material or secondary phase	C04B 2235/441, C04B 2235/3208
Calcium nitrate starting material or secondary phase	C04B 2235/443, C04B 2235/3208
Materials for prostheses based on calcia or calcium oxide CaO	A61F 2310/00221
The preparation of compounds of calcium, barium and strontium in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01F 11/00 and subgroups
treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: calcium carbonates	C09C 1/021, C09C 1/021 and subgroups
treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: calcium sulphates	C09C 1/025, C09C 1/025

C04B 2235/321

Dolomites, i.e. mixed calcium magnesium carbonates

Definition statement

This place covers:

Mixed calcium magnesium carbonate or mixed calcium magnesium oxide, either as starting material or secondary phase in a sintered ceramic.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on oxide mixtures derived from dolomite (containing both CaO and MgO)	C04B 35/06

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Dolomite	$(CaMg)(CO_3)_2$

C04B 2235/3212

Calcium phosphates, e.g. hydroxyapatite

Definition statement

This place covers:

Calcium phosphates such as hydroxyapatite used as starting material for making ceramics or as secondary phase in a sintered ceramic.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on phosphates	C04B 35/447
Phosphate based binders for ceramic materials	C04B 35/6306 and subgroups
Phosphate starting materials for making ceramics or phosphate secondary phases of sintered ceramics	C04B 2235/447

C04B 2235/3213

Strontium oxides or oxide-forming salts thereof

Definition statement

This place covers:

SrO, SrO containing mixed oxides, e.g. lanthanum strontium chromite ($La_{1-x}Sr_xCrO_3$), SrO containing clay, strontium oxide containing silicates, e.g. $SrSiO_3$, strontium salts, e.g. strontium fluoride (SrF_2), strontium containing salts, all used as starting material for making ceramics.

Strontium oxide containing secondary phases of sintered ceramic, e.g. SrO or strontium oxide containing mixed oxides, e.g. strontium aluminate ($Sr_2Al_2O_5$).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on strontium titanate	C04B 35/47
Strontium manganate starting material or secondary phase	C04B 2235/3268, C04B 2235/3213
Sr and Mg doped lanthanum gallate ($(La_{0.90}Sr_{0.10}Ga_{0.80}Mg_{0.2})O_3$ starting material or secondary phase	C04B 2235/3286, C04B 2235/3206, C04B 2235/3213, C04B 2235/3227 (La)
Strontium silicate starting material or secondary phase	C04B 2235/3436, C04B 2235/3213
Strontium alumino-silicate starting material or secondary phase	C04B 2235/3481, C04B 2235/3213
Strontium silicide starting material or secondary phase	C04B 2235/3891

Strontium acetylacetonate starting material or secondary phase	C04B 2235/44, C04B 2235/3213
Strontium phosphate starting material or secondary phase	C04B 2235/447, C04B 2235/3213

C04B 2235/3215

Barium oxides or oxide-forming salts thereof

Definition statement

This place covers:

BaO, barium containing mixed oxides, e.g. barium molybdate ($BaMoO_4$), barium oxide containing clay, barium oxide containing silicates, e.g. celsian ($BaAl_2Si_2O_8$), barium salts, e.g. barium carbonate ($BaCO_3$), barium containing salts, all used as starting material for making ceramics.

Barium oxide containing secondary phases of sintered ceramic, e.g. BaO or barium oxide containing mixed oxides, e.g. barium titanate ($BaTiO_3$.)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on barium titanate	C04B 35/468 and subgroups
Barium titanate starting material or secondary phase	C04B 2235/3236, C04B 2235/3215
Barium gallate ($BaGa_2O_4$) starting material or secondary phase	C04B 2235/3286, C04B 2235/3215
Barium silicate starting material or secondary phase	C04B 2235/3436, C04B 2235/3215
Barium alumino-silicate starting material or secondary phase	C04B 2235/3481, C04B 2235/3215
Barium carbide starting material or secondary phase	C04B 2235/3817
Barium phosphide starting material or secondary phase	C04B 2235/44, C04B 2235/3215
Barium selenide starting material or secondary phase	C04B 2235/446, C04B 2235/3215
treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: barium sulphates	C09C 1/027, C09C 1/027

C04B 2235/3217

Aluminum oxide or oxide forming salts thereof, e.g. bauxite, alpha-alumina

Definition statement

This place covers:

Al_2O_3, Al_2O_3 containing mixed oxides, e.g. aluminum chromate $Al_2(CrO_4)_3$, Al salts, e.g. aluminium nitrite($Al(NO_2)_3$), Al containing salts, e.g. aluminium calcium nitrate, all used as starting material for making ceramics.

Al_2O_3 containing secondary phases of sintered ceramic, e.g. Al_2O_3 or Al_2O_3 containing mixed oxides, e.g. calcium alumino ferrite ($Ca_2(Al,Fe)_2O_5$).

References

Limiting references

This place does not cover:

Aluminium phosphate added as binder	C04B 35/6309

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: alumina	C04B 14/303
Clay wares	C04B 33/00 and sub-classes
Alumina based ceramics	C04B 35/10 and sub-classes
Alumino-silicate based ceramics	C04B 35/18 and sub-classes
Aluminate based ceramics	C04B 35/44 and sub-class
Ceramics based on aluminium titanate	C04B 35/478
Zirconia fine ceramics containing also alumina	C04B 35/4885
Making fibres based on aluminium oxide	C04B 35/62236
Coating or impregnating ceramic substrates with alumina	C04B 41/5031
Aluminum titanate starting material or secondary phase	C04B 2235/3234, C04B 2235/3217
aluminum chromate $Al_2(CrO_4)_3$ starting material or secondary phase	C04B 2235/3243, C04B 2235/3217
Aluminum niobate ($AlNbO_4$) starting material or secondary phase	C04B 2235/3255, C04B 2235/3217
Aluminum tungstate ($Al_2W_2O_9$) starting material or secondary phase	C04B 2235/326, C04B 2235/3217

Aluminum containing ferrite (e.g. $Co_{1-x}Zn_xFe_{2-x}Al_xO_4$) starting material or secondary phase	C04B 2235/3274, C04B 2235/3217, C04B 2235/3275, C04B 2235/3284
Aluminum borate ($Al_2B_2O_6$) starting material or secondary phase	C04B 2235/3409, C04B 2235/3217
Alumino-silicate starting material or secondary phase	C04B 2235/3463 and subgroups
Aluminum glass starting material or secondary phase	C04B 2235/36
Aluminum carbide starting material or secondary phase	C04B 2235/3817
Aluminum nitride starting material or secondary phase	C04B 2235/3865 and subgroup
Aluminum metal starting material or secondary phase	C04B 2235/402
Aluminum nitrite ($Al(NO_2)_3$) starting material	C04B 2235/44, C04B 2235/3217
Aluminum methoxide starting material	C04B 2235/441, C04B 2235/3217
Aluminum sulphide starting material	C04B 2235/446, C04B 2235/3217
Aluminum citrate starting material	C04B 2235/449, C04B 2235/3217
Alumina or aluminate fibers used in ceramic compositions	C04B 2235/5224
Alumina or aluminate interlayer used for joining a ceramic with another substrate	C04B 2237/064
Alumina or aluminate substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/343
Materials for prostheses or coatings of prostheses based on aluminium oxides	A61L 27/105
alumina-based membranes	B01D 71/025, B01D 71/025
Catalysts comprising alumina	B01J 21/04, B01J 21/04, C07C 2521/04
Preparation of aluminium compound powders, e.g. aluminium oxide powder	C01F 7/00 and sub-classes
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: compounds of aluminium	C09C 1/40, C09C 1/40 and subgroups

Special rules of classification

The code C04B 2235/3217 is not given to alumino-silicates, the alumino-silicates just receive the C04B 2235/3463 code.

C04B 2235/3218

Aluminium (oxy)hydroxides, e.g. boehmite, gibbsite, alumina sol

Definition statement

This place covers:

All hydrated alumina starting materials, aluminum hydroxide, alumina sol.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Inorganic binders for ceramics	C04B 35/6303
Metal hydroxides as starting materials for making ceramics	C04B 2235/44

C04B 2235/322

Transition aluminas, e.g. delta or gamma aluminas

Definition statement

This place covers:

Alumina phases that are not stable and convert to alpha alumina upon heating at high temperature, e.g. delta or gamma alumina

References

Limiting references

This place does not cover:

beta-alumina as starting material for making ceramics	C04B 2235/3222

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on beta-alumina	C04B 35/113

C04B 2235/3222

Aluminates other than alumino-silicates, e.g. spinel ($MgAl_2O_4$)

Definition statement

This place covers:

All mixed oxides in which alumina is mixed with alkali metal oxides, alkaline earth metal oxides or rare earth metal oxides, used as starting material for making ceramics or present as secondary phase in sintered ceramics, e.g. spinel ($MgAl_2O_4$), yttrium aluminium garnet (YAG, $Y_3Al_5O_{15}$)

References

Limiting references

This place does not cover:

Aluminum titanate starting material or secondary phase	C04B 2235/3234, C04B 2235/3217
aluminum chromate $Al_2(CrO_4)_3$ starting material or secondary phase	C04B 2235/3243, C04B 2235/3217
Aluminum niobate ($AlNbO_4$) starting material or secondary phase	C04B 2235/3255, C04B 2235/3217
Aluminum tungstate ($Al_2W_2O_9$) starting material or secondary phase	C04B 2235/326, C04B 2235/3217
Aluminum containing ferrite (e.g. $Co_{1-x}Zn_xFe_{2-x}Al_xO_4$) starting material or secondary phase	C04B 2235/3274, C04B 2235/3217, C04B 2235/3275, C04B 2235/3284
Aluminum borate ($Al_2B_2O_6$) starting material or secondary phase	C04B 2235/3409, C04B 2235/3217
Alumino-silicate starting material or secondary phase	C04B 2235/3463 and sub-classes
Alumina or aluminate fibers used in ceramic compositions	C04B 2235/5224

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as active ingredients for mortars, concrete or artificial stone, e.g. accelerators: aluminates	C04B 22/0093
Ceramics based on aluminates	**C04B25/44** and subgroups
Hydraulic aluminate cements	C04B 28/06 and subgroups, C04B 7/323
Clay wares	C04B 33/00 and subgroups
Ceramics based on beta-alumina	C04B 35/113
Ceramics based on silico-aluminates	C04B 35/18 and subgroups
Coating or impregnating ceramic substrates with aluminate	C04B 41/5032
Coating or impregnating ceramic substrates with spinels	C04B 41/5046
Aluminate catalysts or catalysts carrier	B01J 21/04, B01J 23/78
Preparation of alkali metal aluminates powders	C01F 7/04 and sub-classes
Preparation of alkaline earth metal aluminates powders	C01F 7/16 and sub-classes
Purification of aluminates	C01F 7/47 and sub-classes
Luminescent, e.g. electroluminescent, chemiluminescent materials containing aluminates	C09K 11/0838

Luminescent, e.g. electroluminescent, chemiluminescent materials containing germanium, tin or lead aluminates	C09K 11/666
Luminescent, e.g. electroluminescent, chemiluminescent materials containing refractory metal aluminates	C09K 11/676
Luminescent, e.g. electroluminescent, chemiluminescent materials containing chromium, molybdenum or tungsten aluminates	C09K 11/685
Luminescent, e.g. electroluminescent, chemiluminescent materials containing vanadium aluminates	C09K 11/698
Luminescent, e.g. electroluminescent, chemiluminescent materials containing arsenic, antimony or bismuth aluminates	C09K 11/7442, C09K 11/757
Luminescent, e.g. electroluminescent, chemiluminescent materials containing rare earth aluminates	C09K 11/7706, C09K 11/7721, C09K 11/7734, C09K 11/7749, C09K 11/7758, C09K 11/7764, C09K 11/7774, C09K 11/7792

C04B 2235/3224

Rare earth oxide or oxide forming salts thereof, e.g. scandium oxide

Definition statement

This place covers:

Rare earth metal oxides, e.g. Sc_2O_3, Lu_2O_3, Nd_2O_3, rare earth metal containing mixed oxides, e.g. erbium manganite $ErMnO_3$, rare earth oxide containing clay, rare earth oxide containing silicates, e.g. apatite type rare earth silicate $(Sr_2RE_2)(RE_6)(SiO_4)_6O_2$, rare earth salts, e.g. dysprosium sulphide (Dy_2S_3), rare earth metal containing salts, all used as starting material for making ceramics.

Rare earth metal oxide containing secondary phases of sintered ceramic, e.g. Yb_2O_3 or rare earth metal oxide containing mixed oxides, e.g. rare earth niobate ($RENbO_3$.)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on beta alumina (often contains rare earth oxides)	C04B 35/113
Compositions containing one or more ferrites of the group comprising manganese, zinc, nickel, copper or cobalt and one or more ferrites of the group comprising rare earth metals, alkali metals, alkaline earth metals or lead	C04B 35/2608 and subgroups
Compositions containing one or more ferrites of the group comprising rare earth metals and one or more of the group comprising alkali metals, alkaline earth metals or lead	C04B 35/2641
Other ferrites containing rare earth metals, e.g. rare earth ferrite garnets	C04B 35/2675
Ceramics based on rare earth oxide containing cuprates.	C04B 35/4504 and subgroups
Ceramics based on rare-earth compounds	C04B 35/50

Coating or impregnating ceramic substrates with rare earth oxides	C04B 41/5045
Rare earth aluminate starting material or secondary phase	C04B 2235/3222, C04B 2235/3224
Rare earth titanate starting material or secondary phase	C04B 2235/3234, C04B 2235/3224
Rare earth chromate starting material or secondary phase	C04B 2235/3243, C04B 2235/3224
Rare earth zirconate starting material or secondary phase	C04B 2235/3248, C04B 2235/3224
Rare earth niobate starting material or secondary phase	C04B 2235/3255, C04B 2235/3224
Rare earth molybdate starting material or secondary phase	C04B 2235/3256, C04B 2235/3224
Rare earth manganate starting material or secondary phase	C04B 2235/3268, C04B 2235/3224
Rare earth ferrite starting material or secondary phase	C04B 2235/3274, C04B 2235/3224
Rare earth cobaltate starting material or secondary phase	C04B 2235/3275, C04B 2235/3224
Rare earth cuprate starting material or secondary phase	C04B 2235/3282, C04B 2235/3224
Rare earth zincate starting material or secondary phase	C04B 2235/3284, C04B 2235/3224
Rare earth stannate starting material or secondary phase	C04B 2235/3293, C04B 2235/3224
Rare earth bismuthate starting material or secondary phase	C04B 2235/3298, C04B 2235/3224
Rare earth borate starting material or secondary phase	C04B 2235/3409, C04B 2235/3224
Rare earth silicate starting material or secondary phase	C04B 2235/3427, C04B 2235/3224
Rare earth alumino-silicate starting material or secondary phase	C04B 2235/3463, C04B 2235/3224
Rare earth glass starting material or secondary phase	C04B 2235/36
Rare earth boride starting material or secondary phase, e.g. dysprosium boride (DyB_2)	C04B 2235/3804
Rare earth hydroxide starting material	C04B 2235/44, C04B 2235/3224
Rare earth chloride starting material, e.g. ytterbium chloride $YbCl_3$	C04B 2235/444, C04B 2235/3224
Rare earth sulphide starting material, e.g. dysprosium sulphide Dy_2S_3	C04B 2235/446, C04B 2235/3224
Rare earth oxalate starting material	C04B 2235/449, C04B 2235/3224
Rare earth oxide interlayer used for joining a ceramic with another substrate	C04B 2237/066

Catalysts comprising metals or metal oxides or hydroxides of rare earths	B01J 23/10
The preparation of rare earth compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01F 17/00 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing rare earth germinates	C09K 11/7707, C09K 11/7735, C09K 11/775, C09K 11/7775, C09K 11/7793
Luminescent, e.g. electroluminescent, chemiluminescent materials containing rare earth Antimonates; Arsenates	C09K 11/7714, C09K 11/7742, C09K 11/7782, C09K 11/7798

Special rules of classification

The class C04B 2235/3224 is used for the compounds of scandium (Sc), lutetium (Lu), praseodymium (Pr), neodymium (Nd), promethium (Pm), samarium (Sm), europium (Eu), gadolinium (Gd), terbium (Tb), dysprosium (Dy), holmium (Ho), erbium (Er), thulium (Tm), ytterbium (Yb), and in the case rare earths in general are mentioned.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

rare earth oxides	The oxides of scandium (Sc), yttrium (Y), lutetium (Lu), lanthanum (La), cerium (Ce), praseodymium (Pr), neodymium (Nd), promethium (Pm), samarium (Sm), europium (Eu), gadolinium (Gd), terbium (Tb), dysprosium (Dy), holmium (Ho), erbium (Er), thulium (Tm), ytterbium (Yb)

C04B 2235/3225

Yttrium oxide or oxide-forming salts thereof

Definition statement

This place covers:

Yttrium oxide, Y_2O_3, yttrium containing mixed oxides, e.g. yttrium doped zirconia (YSZ), yttrium containing clay, yttrium containing silicates, e.g. yttrium silicate (Y_2SiO_5), yttrium salts, e.g. yttrium chloride (YCl_3), yttrium containing salts, all used as starting material for making ceramics.

Yttrium oxide containing secondary phases of sintered ceramic, e.g. Y_2O_3 or yttrium oxide containing mixed oxides, e.g. yttrium aluminium garnet (YAG, $Y_3Al_5O_{15}$)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on yttrium aluminium garnet (YAG, $Y_3Al_5O_{15}$)	C04B 35/44, C04B 2235/3225, C04B 2235/764 (garnets)
Ceramics based on yttrium stabilised zirconia	C04B 35/486, C04B 2235/3225,

Ceramics based on yttrium oxide	C04B 35/505
Yttrium aluminate (YAG) starting material or secondary phase	C04B 2235/3222, C04B 2235/3225
Yttrium doped zirconia starting material or secondary phase	C04B 2235/3246, C04B 2235/3225
Yttrium ferrite starting material or secondary phase	C04B 2235/3274, C04B 2235/3225
Yttrium silicate starting material or secondary phase	C04B 2235/3427, C04B 2235/3225
Yttrium alumino-silicate starting material or secondary phase	C04B 2235/3463, C04B 2235/3225
Yttrium glass starting material or secondary phase	C04B 2235/36
Yttrium boride starting material or secondary phase	C04B 2235/3804

C04B 2235/3227

Lanthanum oxide or oxide-forming salts thereof

Definition statement

This place covers:

Lanthanum oxide, La_2O_3, lanthanum containing mixed oxides, e.g. lanthanum chromite ($LaCrO_3$), lanthanum containing clay, lanthanum containing silicates, e.g. lanthanum gallium silicate (LGS), also known as langasite, with the chemical formula $A3BC_3D2O_{14}$, lanthanum salts, e.g. lanthanum chloride ($LaCl_3$), lanthanum containing salts, all used as starting material for making ceramics.

Lanthanum oxide containing secondary phases of sintered ceramic, e.g. La_2O_3 or lanthanum oxide containing mixed oxides, e.g. lanthanum niobate vanadate ($LaNb_{1-x}V_xO_4$).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on lanthanum chromite ($LaCrO_3$)	C04B 35/42, C04B 2235/3227
Ceramics based on lanthanum niobate vanadate ($LaNb_{1-x}V_xO_4$)	C04B 35/495, C04B 2235/3227, C04B 2235/3251 (Nb), C04B 2235/3239 (V)
Ceramics based on lanthanum oxide	C04B 35/50 and C04B 2235/3227
lanthanum chromite ($LaCrO_3$) starting material or secondary phase	C04B 2235/3243, C04B 2235/3227
lanthanum niobate vanadate ($LaNb_{1-x}V_xO_4$) starting material or secondary phase	C04B 2235/3255, C04B 2235/3227, C04B 2235/3239 (V)
Sr and Mg doped lanthanum gallate ($(La_{0.90}Sr_{0.10}Ga_{0.80}Mg_{0.2})O_3$ starting material or secondary phase	C04B 2235/3286, C04B 2235/3206, C04B 2235/3213, C04B 2235/3227

lanthanum gallium silicate starting material or secondary phase	C04B 2235/3427, C04B 2235/3227, C04B 2235/3286 (Ga)
Lanthanum alumino-silicate starting material or secondary phase	C04B 2235/3463, C04B 2235/3227
Lanthanum glass starting material or secondary phase	C04B 2235/36
Lanthanum boride (LaB_6) starting material or secondary phase	C04B 2235/3804

C04B 2235/3229

Cerium oxides or oxide-forming salts thereof

Definition statement

This place covers:

Cerium oxide, Ce_2O_3 or CeO_2, cerium containing mixed oxides, e.g. cerium gadolium oxide (CGO, $Ce_{1-x}Gd_xO_2$), cerium containing clay, cerium containing silicates, e.g. $Ce_6[Si_4O_{13}][SiO_4]_2$, cerium salts, e.g. cerium nitrate ($Ce(NO_3)_3$), cerium containing salts, all used as starting material for making ceramics.

Cerium oxide containing secondary phases of sintered ceramic, e.g. Ce_2O_3 or cerium oxide containing mixed oxides, e.g. cerium stabilised zirconia.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on cerium stabilised zirconia	C04B 35/486, C04B 2235/3229
Ceramics based on cerium gadolium oxide (CGO, $Ce_{1-x}Gd_xO_2$)	C04B 35/50, C04B 2235/3229
Ceramics based on cerium oxide	C04B 35/50 and C04B 2235/3229
cerium gadolium oxide (CGO, $Ce_{1-x}Gd_xO_2$) starting material or secondary phase	C04B 2235/3229, C04B 2235/3224
cerium stabilised zirconia starting material or secondary phase	C04B 2235/3248, C04B 2235/3229
cerium silicate starting material or secondary phase	C04B 2235/3427, C04B 2235/3229
Cerium alumino-silicate starting material or secondary phase	C04B 2235/3463, C04B 2235/3229
Cerium glass starting material or secondary phase	C04B 2235/36
Cerium carbide (CeC_2) starting material or secondary phase	C04B 2235/3804

C04B 2235/3231

Refractory metal oxides, their mixed metal oxides, or oxide-forming salts thereof

Definition statement

This place covers:

Refractory metal oxides, e.g. TiO_2, WO_6, refractory metal containing mixed oxides, e.g. calcium zirconate ($CaZrO_3$), refractory oxide containing clay, refractory oxide containing silicates, e.g. barium titanium silicate ($BaTiSi_3O_9$), refractory salts, e.g. vanadium chloride (VCl_3), refractory metal containing salts, all used as starting material for making ceramics.

Refractory metal oxide containing secondary phases of sintered ceramic, e.g. CrO_3 or refractory metal oxide containing mixed oxides, e.g. barium titanate ($BaTiO_3$.)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on vanadium, niobium, tantalum, molybdenum or tungsten oxides or solid solutions thereof with other oxides, e.g. vanadates, niobates, tantalates, molybdates or tungstates	C04B 35/495 and subgroups
Refractory metal boride starting material or secondary phase	C04B 2235/3813
Refractory metal carbide starting material or secondary phase	C04B 2235/3839 and subgroups
Refractory metal nitride starting material or secondary phase	C04B 2235/3886
Refractory metal silicide starting material or secondary phase	C04B 2235/3891
Refractory metal starting material or secondary phase	C04B 2235/404
Refractory metal oxide interlayer used for joining a ceramic with another substrate	C04B 2237/068
Refractory metal oxide substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/345

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

refractory oxides	titanium oxide, vanadium oxide, chromium oxide, zirconium oxide, niobium oxide, molybdenum oxide, hafnium oxide, tantalum oxide, tungsten oxide

C04B 2235/3232

Titanium oxides or titanates, e.g. rutile or anatase

Definition statement

This place covers:

Titanium oxides (titania), e.g. TiO_2, titanium containing mixed oxides, e.g. lanthanum titanate ($LaTiO_3$), titanium oxide containing clay, titanium oxide containing silicates, e.g. barium titanium silicate

($BaTiSi_3O_9$), titanium salts, e.g. titanium hydroxide ($TiO(OH)_2$), titanium metal containing salts, all used as starting material for making ceramics.

Titanium metal oxide containing secondary phases of sintered ceramic, e.g. rutile (TiO_2) or titanium metal oxide containing mixed oxides, e.g. strontium titanate ($SrTiO_3$.)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: titania, e.g. titanates	C04B 14/305
Ceramics based on titanium oxide	C04B 35/46
Making fibres based on titanium oxide	C04B 35/62259
Coating or impregnating ceramic substrates with titanium oxides or titanates	C04B 41/5041
titanium ferrite ($TiFe_2O_4$) starting material or secondary phase	C04B 2235/3232, C04B 2235/3274
barium titanium silicate ($BaTiSi_3O_9$) starting material or secondary phase	C04B 2235/3436, C04B 2235/3215, C04B 2235/3232
Titanium containing glass starting material or secondary phase	C04B 2235/36
Titanium diboride (TiB_2) starting material or secondary phase	C04B 2235/3813
Titanium carbide (TiC) starting material or secondary phase	C04B 2235/3843
Titanium nitride (TiN) starting material or secondary phase	C04B 2235/3886
Titanium disilicide ($TiSi_2$) starting material or secondary phase	C04B 2235/3891
Titanium starting material or secondary phase	C04B 2235/404
titanium hydroxide ($TiO(OH)_2$) starting material or secondary phase	C04B 2235/44, C04B 2235/3232
Titania or titanate substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/346
Catalysts or catalyst carriers comprising titanium; Oxides or hydroxides thereof	B01J 21/063, B01J 21/063
The preparation of titanium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 23/00 and subgroups
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: compounds of titanium	C09C 1/36, C09C 1/36 and subgroups

C04B 2235/3234

Titanates, not containing zirconia

Definition statement

This place covers:

Titanates, e.g. aluminium titanate (Al_2TiO_5) or mixed niobate-titanates, used as starting material for making ceramics

Titanate containing secondary phases of sintered ceramic, e.g. lead titanate ($PbTiO_3$).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on titanates	C04B 35/462 and subgroups
Ceramics based on zirconates-titanates	C04B 35/49 and subgroups
Ceramics based on vanadium, niobium, tantalum, molybdenum or tungsten oxides or solid solutions thereof with other oxides, e.g. vanadates, niobates, tantalates, molybdates or tungstates, based on solid solutions with lead, containing also titanates	C04B 35/499
Ceramics or ceramic mixtures based on vanadium, niobium, tantalum, molybdenum or tungsten oxides or solid solutions thereof with other oxides, e.g. vanadates, niobates, tantalates, molybdates or tungstates containing also lead and also titanates	C04B 35/499
Zirconates or hafnates containing also titanium oxide or titanates as starting material for making ceramics or as secondary phase in a ceramic	C04B 2235/3249
The preparation of titanium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds containing, besides titanium, two or more other elements, with the exception of oxygen or hydrogen	C01G 23/002
The preparation of titanate compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 23/003 and subgroups

C04B 2235/3236

Alkaline earth titanates

Definition statement

This place covers:

Alkaline earth titanates, e.g. magnesium titanate ($MgTiO_3$), used as starting material for making ceramics.

Titanate containing secondary phases of sintered ceramic, e.g. barium titanate ($BaTiO_3$).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on alkaline earth titanates	C04B 35/465 and subgroups
Alkaline earth oxides or salts as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3205 and subgroups
barium titanium manganite ($BaTi_{1/2}Fe_{1/2}O_3$) starting material or secondary phase	C04B 2235/3236, C04B 2235/3268, C04B 2235/3215
The preparation of alkaline earth metal titanate compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 23/006

C04B 2235/3237

Substoichiometric titanium oxides, e.g. Ti_2O_3

Definition statement

This place covers:

Titanium oxide with the formula TiO_x, where x < 2, e.g. Ti_2O_3 or TiO, used as starting material for making a ceramic or present as a secondary in a sintered ceramic.

References

Limiting references

This place does not cover:

A sintered ceramic having as the main phase a sub-stoichiometric titanium oxide	C04B 35/46 and C04B 2235/79
A sintered ceramic having as the main phase a sub-stoichiometric titanate phase, e.g. $BaTiO_{2.9}$	C04B 35/462 and subgroups (C04B 35/4682 for barium titanate) and C04B 2235/79

Informative references

Attention is drawn to the following places, which may be of interest for search:

The preparation titanium sub-oxide compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 23/043
Compositional and structural details of pigments exhibiting interference colours the core consisting of an inorganic suboxide or a mixture thereof, e.g. SiO_x, TiO_x	C09C 2200/1037 and sub-classes

C04B 2235/3239

Vanadium oxides, vanadates or oxide forming salts thereof, e.g. magnesium vanadate

Definition statement

This place covers:

Vanadium oxides, e.g. V_2O_5, vanadium containing mixed oxides, e.g. yttrium vanadate (YVO_4), vanadium oxide containing clay, vanadium oxide containing silicates, e.g. cavansite ($Ca(VO)Si_4O_{10}(H_2O)_4$), vanadium salts, e.g. ammonium vanadate (NH_4VO_3), vanadium metal containing salts, all used as starting material for making ceramics.

Vanadium metal oxide containing secondary phases of sintered ceramic, e.g. VO_2 or vanadium metal oxide containing mixed oxides, e.g. magnesium vanadate ($Mg_2V_2O_7$).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on vanadium, niobium, tantalum, molybdenum or tungsten oxides or solid solutions thereof with other oxides, e.g. vanadates, niobates, tantalates, molybdates or tungstates	C04B 35/495 and subgroups
vanadium containing ferrite ($Li_{0.5}$+t$Zn_{0.2}Ti_{0.2}$V$tFe_{2.1}$−2tO_4) starting material or secondary phase	C04B 2235/3239, C04B 2235/3274 (ferrite), C04B 2235/3203 (Li), C04B 2235/3284 (Zn), C04B 2235/3232 (Ti)
vanadium oxide containing silicates, e.g. cavansite ($Ca(VO)Si_4O_{10}(H_2O)_4$) starting material or secondary phase	C04B 2235/3454 (Ca-silicate), C04B 2235/3208 (Ca), C04B 2235/3239
Vanadium containing glass starting material or secondary phase	C04B 2235/36
Vanadium diboride (VB_2) starting material or secondary phase	C04B 2235/3813
Vanadium carbide (VC) starting material or secondary phase	C04B 2235/3839
Vanadium nitride (VN) starting material or secondary phase	C04B 2235/3886
Vanadium disilicide (VSi_2) starting material or secondary phase	C04B 2235/3891
Vanadium starting material or secondary phase	C04B 2235/404
vanadium carbonyl ($V(CO)_6$) starting material or secondary phase	C04B 2235/44, C04B 2235/3232
Catalysts comprising metals or metal oxides or hydroxides of vanadium	B01J 23/22
The preparation of vanadium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 31/00 and subgroups
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: compounds of bismuth and vanadium	C09C 1/0006, C09C 1/0006
Luminescent, e.g. electroluminescent, chemiluminescent materials containing vanadates	C09K 11/085
Luminescent, e.g. electroluminescent, chemiluminescent materials containing vanadium	C09K 11/69 and subgroups

Luminescent, e.g. electroluminescent, chemiluminescent materials containing arsenic, antimony or bismuth vanadates; Chromates; Molybdates; Tungstates	C09K 11/7457, C09K 11/758
Luminescent, e.g. electroluminescent, chemiluminescent materials containing rare earth vanadates; Chromates; Molybdates; Tungstates	C09K 11/7708, C09K 11/7722, C09K 11/7736, C09K 11/7751, C09K 11/7765, C09K 11/7776, C09K 11/7794

C04B 2235/3241

Chromium oxides, chromates, or oxide-forming salts thereof

Definition statement

This place covers:

Chromium oxides, e.g. Cr_2O_3, chromium containing mixed oxides, e.g. cobalt chromite ($CoCr_2O_4$), chromium oxide containing clay, chromium oxide containing silicates, e.g. uvarovite ($Ca_3Cr_2(SiO_4)_3$), chromium salts, e.g. chromium perchlorate ($Cr(ClO_4)_3$), chromium metal containing salts, all used as starting material for making ceramics.

Chromium metal oxide containing secondary phases of sintered ceramic, e.g. CrO_3 or chromium metal oxide containing mixed oxides, e.g. cobalt chromate ($CoCrO_4$)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone Chromium oxide	C04B 14/307
Magnesia-based refractories containing chromia	C04B 35/047 and subgroups C04B 35/051
Alumina-based refractories containing chromia	C04B 35/105
Ceramics based on chromium oxide	C04B 35/12
Ceramics based on chromites	C04B 35/42
Coating or impregnating ceramic substrates with chromium oxide	C04B 41/5033
chromium containing ferrite ($NiCr_xFe_{2-x}O_4$) starting material or secondary phase	C04B 2235/3241, C04B 2235/3274 (ferrite), C04B 2235/3279 (Ni)
chromium oxide containing silicates, e.g. uvarovite ($Ca_3Cr_2(SiO_4)_3$) starting material or secondary phase	C04B 2235/3454 (Ca-silicate), C04B 2235/3208 (Ca), C04B 2235/3241
Chromium containing glass starting material or secondary phase	C04B 2235/36
Chromium boride (CrB or CrB_2) starting material or secondary phase	C04B 2235/3813
Chromium carbide (Cr_3C_2) starting material or secondary phase	C04B 2235/3839
Chromium nitride (CrN) starting material or secondary phase	C04B 2235/3886

Chromium silicide ($CrSi_2$) starting material or secondary phase	C04B 2235/3891
Chromium starting material or secondary phase	C04B 2235/404
chromium perchlorate ($Cr(ClO_4)_3$) starting material or secondary phase	C04B 2235/444, C04B 2235/3241
Materials for prostheses based on chromium oxides	A61F 2310/00233
The preparation of chromium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 37/00 and subgroups
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: compounds of chromium	C09C 1/34, C09C 1/34 and subgroups

C04B 2235/3243

Chromates or chromites, e.g. aluminum chromate, lanthanum strontium chromite

Definition statement

This place covers:

Chromites and chromates, e.g. aluminum chromate $Al_2(CrO_4)_3$. All starting powders or secondary phases of sintered ceramics containing mixed oxides of chromium with alkali metals, alkaline earth metals and rare earth metals, not containing other transition or post-transition metal oxides, or mixed oxides of chromium with other transition or post-transition metal oxides, in which the amount of chromium is larger than of any other transition or post-transition metal oxide, e.g. a mixture with titanium oxide, containing more Cr, e.g. $Cr_{0.6}Ti_{0.4}O_2$.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as active ingredients for mortars, concrete or artificial stone, e.g. accelerators	C04B 22/087
Ceramics based on chromites	C04B 35/42
Chromite containing catalysts	B01J 23/26, B01J 23/86 and subgroups
The preparation of chromium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, compounds containing, besides chromium, two or more other elements, with the exception of oxygen or hydrogen	C01G 37/006
The preparation of chromium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds being chromates or bichromates	C01G 37/14
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: zinc chromate	C09C 1/08, C09C 1/08
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: lead chromate	C09C 1/20, C09C 1/20
Luminescent, e.g. electroluminescent, chemiluminescent materials containing chromium, molybdenum or tungsten	C09K 11/68 and subgroups

Luminescent, e.g. electroluminescent, chemiluminescent materials containing arsenic, antimony or bismuth vanadates; Chromates; Molybdates; Tungstates	C09K 11/7457, C09K 11/758
Luminescent, e.g. electroluminescent, chemiluminescent materials containing rare earth vanadates; Chromates; Molybdates; Tungstates	C09K 11/7708, C09K 11/7722, C09K 11/7736, C09K 11/7751, C09K 11/7765, C09K 11/7776, C09K 11/7794

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

chromate	Chromate salts contain the chromate anion, CrO_4^{2-}, with Cr(VI)
chromite	Chromite salts contain the chromite anion, $Cr_2O_4^{2-}$, with Cr(III)

C04B 2235/3244

Zirconium oxides, zirconates, gafmium oxides, hafnates, or oxide-forming salts thereof

Definition statement

This place covers:

Zirconium or hafnium oxides, e.g. ZrO_2 or HfO_2, zirconium or hafnium containing mixed oxides, e.g. bismuth zirconate ($2Bi_2O_3 \cdot 3ZrO_2$), zirconium or hafnium oxide containing clay, zirconium or hafnium oxide containing silicates, e.g. hafnium silicate ($HfSiO_4$), zirconium or hafnium salts, e.g. zirconium iodide (ZrI_4), zirconium or hafnium containing salts, all used as starting material for making ceramics.

Zirconia or hafnia containing secondary phases of a sintered ceramic, e.g. yttrium stabilised zirconia (YSZ) or zirconium or hafnium oxide containing mixed oxides, e.g. lithium zirconate (Li_2ZrO_3).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: Zirconium oxide	C04B 14/306
Alumina based refractories containing zirconia	C04B 35/106
Alumina refractories containing zirconia, made by melt-casting	C04B 35/109
fine alumina ceramics containing zirconia	C04B 35/119
Ceramics based on zirconia or zirconates, hafnia or hafnates	C04B 35/48 and subgroups
Making fibres based on zirconium oxide	C04B 35/6225
Coating or impregnating ceramic substrates with zirconium oxides or zirconates, hafnium oxides or hafnates	C04B 41/5042 and subgroups

Zirconium of hafnium containing glass starting material or secondary phase	C04B 2235/36
Zirconium of hafnium diboride (ZrB_2 or HfB_2) starting material or secondary phase	C04B 2235/3813
Zirconium of hafnium carbide (ZrC or HfC) starting material or secondary phase	C04B 2235/3839
Zirconium of hafnium nitride (ZrN or HfN) starting material or secondary phase	C04B 2235/3886
Zirconium of hafnium disilicide ($ZrSi_2$ or $HfSi_2$) starting material or secondary phase	C04B 2235/3891
Zirconium of hafnium starting material or secondary phase	C04B 2235/404
zirconium of hafnium phosphide (ZrP_2 or HfP_2) starting material or secondary phase	C04B 2235/44, C04B 2235/3244
Zirconia fibers as starting material for making ceramics	C04B 2235/5236
Zirconia, hafnia, zirconate or hafnate substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/348
Catalysts comprising Zirconium or hafnium; Oxides or hydroxides thereof	B01J 21/066, B01J 21/066
The preparation of zirconium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 25/00 and subgroups

Special rules of classification

If the class C04B 35/119 is given, it's not necessary anymore to give the symbol C04B 2235/3244.

C04B 2235/3246

Stabilised zirconias, e.g. YSZ or cerium stabilised zirconia

Definition statement

This place covers:

Zirconia or hafnia, which without additives have a monoclinic lattice, are stabilised in a tetragonal or cubic phase through the dissolution in the lattice of a stabilising cation, either an alkaline earth metal oxide, e.g. MgO, or a rare earth oxide (yttria, ceria).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Alkaline earth metal oxides as starting material or secondary phase	C04B 2235/3205 and subgroups
Rare earth metal oxides as starting material or secondary phase	C04B 2235/3224 and subgroups
Ceramic material having a monoclinic lattice	C04B 2235/76
Ceramic material having a cubic lattice	C04B 2235/762
Ceramic material having a tetragonal lattice	C04B 2235/765

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

YSZ	Yttria-stabilised zirconia
3Y-TZP	Zirconia partially stabilised in the tetragonal phase by 3 mol% yttria

C04B 2235/3248

Zirconates or hafnates, e.g. zircon

Definition statement

This place covers:

Zirconates or hafnates, e.g. bismuth zirconate ($2Bi_2O_3 \cdot 3ZrO_2$), used as starting material for making ceramics.

Zirconate or hafnate containing secondary phases of a sintered ceramic, e.g. magnesium zirconate or hafnate ($MgHfO_3$), zirconium silicate (zircon $ZrSiO_4$).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: zircon	C04B 14/046
Alumina based refractories containing zircon	C04B 35/106
Alumina based refractories containing zircon, made by melt-casting	C04B 35/109
Ceramics based on silicates	C04B 35/16 and subgroups
Ceramics based on zircon	C04B 35/481
Silicate starting material for making ceramics or present as a secondary phase in a sintered ceramic	C04B 2235/3427 and subgroups
The preparation of zirconium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates: the compounds containing, besides zirconium, two or more other elements, with the exception of oxygen or hydrogen	C01G 25/006

Special rules of classification

Zircon is in principle the only silicate that is not classified as a silicate, but is classified according to the other metal cation(s) present in the silicate.

C04B 2235/3249

containing also titanium oxide or titanates, e.g. lead zirconate titanate (PZT)

Definition statement

This place covers:

Mixed zirconate-titanates (or hafnates-titanates) used as starting material for making a ceramic or present as secondary phase in a sintered ceramic, e.g. lead zirconate titanate (PZT).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on zirconates-titanates	C04B 35/49 and subgroups
Titanate starting material or secondary phase not containing zirconium	C04B 2235/3234 and subgroups

C04B 2235/3251

Niobium oxides, niobates, tatalum oxides, tantalates, or oxide-forming salts thereof

Definition statement

This place covers:

Niobium or tantalum oxides, e.g. Nb_2O_5 or Ta_2O_5, niobium or tantalum containing mixed oxides, e.g. lithium niobate ($LiNbO_3$), niobium or tantalum oxide containing clay, niobium or tantalum oxide containing silicates, e.g. murmanite ($Na_2(Ti,Nb)_2Si_2O_9$-n(H_2O)), niobium or tantalum salts, e.g. tantalum selenide ($TaSe_2$), niobium or tantalum containing salts, all used as starting material for making ceramics.

Niobium oxide or tantalum oxide containing secondary phases of a sintered ceramic, e.g. Nb_2O_5 or Ta_2O_5 or niobium or tantalum oxide containing mixed oxides, e.g. strontium bismuth niobate ($SrBi_2Nb_2O_9$).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on vanadium, niobium, tantalum, molybdenum or tungsten oxides or solid solutions thereof with other oxides, e.g. vanadates, niobates, tantalates, molybdates or tungstates	C04B 35/495 and subgroups
Coating or impregnating ceramic substrates with niobium oxides or niobates	C04B 41/5051
murmanite ($Na_2(Ti,Nb)_2Si_2O_9$-n(H_2O)) starting material or secondary phase	C04B 2235/3427, C04B 2235/3201 (Na), C04B 2235/3232 (Ti), C04B 2235/3251
Niobium or tantalum containing glass starting material or secondary phase	C04B 2235/36

Niobium or tantalum diboride (NbB_2 or TaB_2) starting material or secondary phase	C04B 2235/3813
Niobium or tantalum carbide (NbC or TaC) starting material or secondary phase	C04B 2235/3839
Niobium or tantalum nitride (NbN or TaN) starting material or secondary phase	C04B 2235/3886
Niobium or tantalum disilicide ($NbSi_2$ or $TaSi_2$) starting material or secondary phase	C04B 2235/3891
Niobium or tantalum starting material or secondary phase	C04B 2235/404
niobium or tantalum telluride ($TaTe_2$) starting material or secondary phase	C04B 2235/446, C04B 2235/3251
The preparation of niobium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 33/00 and subgroups
The preparation of tantalum compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 35/00 and subgroups

C04B 2235/3253

Substoichiometric niobium or tantalum oxides, e.g. NbO

Definition statement

This place covers:

Niobium or tantalum oxide with the formula NbO_x or TaO_x, where $x < 2$, e.g. Ta_2O_3 or NbO, used as starting material for making a ceramic or present as a secondary in a sintered ceramic.

References

Limiting references

This place does not cover:

A sintered ceramic having as the main phase a sub-stoichiometric niobium or tantalum oxide (not having used sub-stoichiometric niobium or tantalum oxide as starting material).	C04B 35/495, C04B 2235/3251 and C04B 2235/79
A sintered ceramic having as the main phase a sub-stoichiometric niobate or tantalate phase, e.g. $KNbiO_{2.9}$	C04B 35/495 and subgroups, C04B 2235/3251 and C04B 2235/79

Informative references

Attention is drawn to the following places, which may be of interest for search:

A sintered ceramic having as the main phase a stoichiometric niobium or tantalum oxide, or niobate or tantalate	C04B 35/495, C04B 2235/3251

C04B 2235/3255

Niobates or tantalates, e.g. silver niobate

Definition statement

This place covers:

Niobates or tantalates, e.g. silver niobate ($AgNbO_3$), used as starting material for making ceramics.

Niobate or tantalate containing secondary phases of a sintered ceramic, e.g. potassium niobate or tantalate ($KTaO_3$).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

The preparation of niobium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds containing, besides niobium, two or more other elements, with the exception of oxygen or hydrogen	C01G 33/006
The preparation of tantalum compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds containing, besides tantalum, two or more other elements, with the exception of oxygen or hydrogen	C01G 35/006

C04B 2235/3256

Molybdenum oxides, molybdates or oxide forming salts thereof, e.g. cadmium molybdate

Definition statement

This place covers:

Molybdenum oxides, e.g. Mo_2O_3, molybdenum containing mixed oxides, e.g. bismuth molybdate (Bi_2MoO_6 or $Bi_2(MoO_4)_3$), molybdenum oxide containing clay, molybdenum oxide containing silicates, molybdenum salts, e.g. molybdenum oxy trichloride ($MoOCl_3$), molybdenum metal containing salts, all used as starting material for making ceramics.

Molybdenum metal oxide containing secondary phases of sintered ceramic, e.g. MoO_2 or molybdenum metal oxide containing mixed oxides, e.g. cadmium molybdate ($CdMoO_4$).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on vanadium, niobium, tantalum, molybdenum or tungsten oxides or solid solutions thereof with other oxides, e.g. vanadates, niobates, tantalates, molybdates or tungstates	C04B 35/495 and subgroups
molybdenum containing ferrite $Fe_{2-x}Zn_xMoO_4$ (0.0<=x<=1.0) starting material or secondary phase	C04B 2235/3251, C04B 2235/3274 (ferrite), C04B 2235/3284 (Zn)
Molybdenum containing glass starting material or secondary phase	C04B 2235/36

Molybdenum boride (Mo_2B or Mo_2B_5) starting material or secondary phase	C04B 2235/3813
Molybdenum carbide (MoC or Mo_2C) starting material or secondary phase	C04B 2235/3839
Molybdenum nitride (MoN) starting material or secondary phase	C04B 2235/3886
Molybdenum disilicide ($MoSi_2$) starting material or secondary phase	C04B 2235/3891
Molybdenum starting material or secondary phase	C04B 2235/404
molybdophosphoric acid ($H_3P(Mo_3O_{10})_4$ starting material or secondary phase	C04B 2235/447, C04B 2235/3256
Catalysts comprising metals or metal oxides or hydroxides of molybdenum	B01J 23/28
The preparation of molybdenum compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 39/00 and subgroups
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: compounds of molybdenum	C09C 1/0003, C09C 1/0003
Luminescent, e.g. electroluminescent, chemiluminescent materials containing chromium, molybdenum or tungsten	C09K 11/68 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing arsenic, antimony or bismuth vanadates; Chromates; Molybdates; Tungstates	C09K 11/7457, C09K 11/758
Luminescent, e.g. electroluminescent, chemiluminescent materials containing rare earth vanadates; Chromates; Molybdates; Tungstates	C09K 11/7708, C09K 11/7722, C09K 11/7736, C09K 11/7751, C09K 11/7765, C09K 11/7776, C09K 11/7794

C04B 2235/3258

Tungsten oxides, tungstates, or oxide-forming salts thereof

Definition statement

This place covers:

Tungsten oxides, e.g. WO_2, tungsten containing mixed oxides, e.g. barium strontium tungstate (Ba_2SrWO_6), tungsten oxide containing clay, tungsten oxide containing silicates, tungsten salts, e.g. tungsten bromide (WBr_5), tungsten metal containing salts, all used as starting material for making ceramics.

Tungsten metal oxide containing secondary phases of sintered ceramic, e.g. WO_3 or tungsten metal oxide containing mixed oxides, e.g. scheelite ($CaWO_4$) or huebnerite ($MnWO_4$)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on vanadium, niobium, tantalum, molybdenum or tungsten oxides or solid solutions thereof with other oxides, e.g. vanadates, niobates, tantalates, molybdates or tungstates	C04B 35/495 and subgroups

Tungsten containing glass starting material or secondary phase	C04B 2235/36
Tungsten boride (W_2B, WB or W_2B_5) starting material or secondary phase	C04B 2235/3813
Tungsten carbide (WC) starting material or secondary phase	C04B 2235/3847
Tungsten nitride (W_2N or WN_2) starting material or secondary phase	C04B 2235/3886
Tungsten silicide (WSi_2) starting material or secondary phase	C04B 2235/3891
Tungsten starting material or secondary phase	C04B 2235/404
tungsten ethanolate ($W(C_2H_5O)_5$) starting material or secondary phase	C04B 2235/441, C04B 2235/3258
Catalysts comprising metals or metal oxides or hydroxides of tungsten	B01J 23/30
The preparation of tungsten compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 41/00 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing chromium, molybdenum or tungsten	C09K 11/68 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing arsenic, antimony or bismuth vanadates; Chromates; Molybdates; Tungstates	C09K 11/7457, C09K 11/758
Luminescent, e.g. electroluminescent, chemiluminescent materials containing rare earth vanadates; Chromates; Molybdates; Tungstates	C09K 11/7708, C09K 11/7722, C09K 11/7736, C09K 11/7751, C09K 11/7765, C09K 11/7776, C09K 11/7794

C04B 2235/326

Tungstates, e.g. scheelite

Definition statement

This place covers:

Tungstates, e.g. copper tungstate ($CuWO_4$), or iron tungstate ($FeWO_4$) used as starting material for making ceramics.

Tungstate containing secondary phases of a sintered ceramic, e.g. zirconium tungstate ($Zr(WO_4)_2$).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

The preparation of tungsten compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, compounds containing, besides tungsten, two or more other elements, with the exception of oxygen or hydrogen	C01G 41/006

C04B 2235/3262

Manganese oxides, manganates, rhenium oxides or oxide-forming salts thereof, e.g. MnO

Definition statement

This place covers:

Manganese or rhenium oxides, e.g. MnO or Re_2O_7, manganese or rhenium containing mixed oxides, e.g. lithium manganite (Li_2MnO_3), manganese or rhenium oxide containing clay, manganese or rhenium oxide containing silicates, e.g. tephroite (Mn_2SiO_4), manganese or rhenium salts, e.g. rhenium dioxydifluoride(ReO_2F_2), manganese or rhenium containing salts, all used as starting material for making ceramics.

Manganese oxide or rhenium oxide containing secondary phases of a sintered ceramic, e.g. MnO_3 or ReO_3 or manganese or rhenium oxide containing mixed oxides, e.g. barium manganate ($BaMnO_4$).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on manganites	C04B 35/016
Compositions containing one or more ferrites of the group comprising manganese, zinc, nickel, copper or cobalt and one or more ferrites of the group comprising rare earth metals, alkali metals, alkaline earth metals or lead	C04B 35/2608 and subgroups
Compositions containing one or more ferrites of the group comprising manganese, zinc and one or more ferrites of the group comprising nickel, copper or cobalt	C04B 35/265
Other ferrites containing manganese or zinc, e.g. Mn-Zn ferrites	C04B 35/2658
Coating or impregnating ceramic substrates with manganates	C04B 41/5028
manganese aluminate (Al_2MnO_4) starting material or secondary phase	C04B 2235/3262, C04B 2235/3222
manganese titanate ($MnTiO_3$) starting material or secondary phase	C04B 2235/3262, C04B 2235/3234
manganese vanadate (MnV_2O_6) starting material or secondary phase	C04B 2235/3262, C04B 2235/3239
manganese chromate ($MnCrO_4$) starting material or secondary phase	C04B 2235/3262, C04B 2235/3243
manganese zirconate ($MnZrO_3$) starting material or secondary phase	C04B 2235/3262, C04B 2235/3248
manganese niobate ($MnNb_2O_6$) starting material or secondary phase	C04B 2235/3262, C04B 2235/3255
manganese molybdate ($MnMnO_4$) starting material or secondary phase	C04B 2235/3262, C04B 2235/3256
manganese tungstate, hubnerite, ($MnWO_4$) starting material or secondary phase	C04B 2235/3262, C04B 2235/326
manganese ferrite ($MnFe_2O_4$) starting material or secondary phase	C04B 2235/3262, C04B 2235/3274

manganese cobaltite ($MnCo_2O_4$) starting material or secondary phase	C04B 2235/3262, C04B 2235/3275
manganese stannate ($MnSnO_3$) starting material or secondary phase	C04B 2235/3262, C04B 2235/3293
manganese tetraborate (MnB_4O_7) starting material or secondary phase	C04B 2235/3409, C04B 2235/3262
manganese silicate (tephroite, Mn_2SiO_4 or $MnSiO_3$) starting material or secondary phase	C04B 2235/3427, C04B 2235/3262
Manganese oxide containing glass starting material or secondary phase	C04B 2235/36
Manganese boride (Mn_2B, MnB or MnB_2) starting material or secondary phase	C04B 2235/3804
Manganese carbide (Mn_3C) starting material or secondary phase	C04B 2235/3817
Manganese silicide ($MnSi_2$) starting material or secondary phase	C04B 2235/3891
Manganese starting material or secondary phase	C04B 2235/40
manganese sulphate $MnSO_4$ starting material or secondary phase	C04B 2235/448, C04B 2235/3232
The preparation of manganese compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 45/00
The preparation of rhenium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 47/00
Luminescent, e.g. electroluminescent, chemiluminescent materials containing manganese or rhenium	C09K 11/57 and subgroups
Electrolytic production of manganese oxides	C25B 1/21

C04B 2235/3263

Mn_3O_4

Definition statement

This place covers:

Mn_3O_4 as starting material for making ceramics or as secondary phase in sintered ceramics.

C04B 2235/3265

Mn_2O_3

Definition statement

This place covers:

Mn_2O_3 as starting material for making ceramics or as secondary phase in sintered ceramics.

C04B 2235/3267

MnO_2

Definition statement

This place covers:

MnO_2 as starting material for making ceramics or as secondary phase in sintered ceramics.

C04B 2235/3268

Manganates, manganites, rhenates or rhenites, e.g. lithium manganite, barium manganate, rhenium oxide

Definition statement

This place covers:

Manganites, e.g. lithium manganite (Li_2MnO_3), or manganates, e.g. barium manganate ($BaMnO_4$) used as starting material for making ceramics or present as secondary phase in a sintered ceramic.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

The preparation of manganese compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, compounds containing, besides manganese, two or more other elements, with the exception of oxygen or hydrogen	C01G 45/006
The preparation of manganese compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds being manganates or permanganates	C01G 45/12

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

manganate	Any negatively charged molecular entity with manganese as the central atom. However, the name is usually used to refer to the tetraoxidomanganate(2−) anion, MnO_4^{2-}, also known as manganate(VI) because it contains manganese in the +6 oxidation state. Manganates are the only known manganese(VI) compounds
manganite	A MnO_3^{3-} ion containing Mn(III)

C04B 2235/327

Iron group oxides, their mixed metal oxides, or oxide-forming salts thereof

Definition statement

This place covers:

Iron group oxides, e.g. FeO, Co_3O_4, iron group containing mixed oxides, e.g. lithium cobaltite ($LiCoO_2$), iron group oxide containing clay, iron group oxide containing silicates, e.g. garnierite

($(Ni,Mg)_3Si_2O_5(OH)_4$), iron group salts, e.g. ferrous chloride ($FeCl_2$), iron group containing salts, all used as starting material for making ceramics.

Iron group oxide containing secondary phases of a sintered ceramic, e.g. Fe_2O_3 or iron group oxide containing mixed oxides, e.g. barium hexaferrite ($BaFe_{12}O_{19}$.)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Iron group metal starting material or secondary phase	C04B 2235/405
Luminescent, e.g. electroluminescent, chemiluminescent materials containing iron, nickel and cobalt	C09K 11/60 and subgroups

Special rules of classification

The symbol C04B 2235/327 is little used, since normally symbols of one or more of the subgroups can be attributed. Only if it is mentioned that iron group oxides are used without specifying which ones, this symbol is used.

C04B 2235/3272

Iron oxides or oxide forming salts thereof, e.g. hematite, magnetite

Definition statement

This place covers:

Iron oxides, e.g. Fe_3O_4 (magnetite) or FeO (wüstite), iron oxide containing mixed oxides, e.g. cobalt ferrite ($CoFe_2O_4$), iron oxide containing clay, iron oxide containing silicates, e.g. fayalite Fe_2SiO_4), iron salts, e.g. iron sulphate ($FeSO_4$), iron metal containing salts, all used as starting material for making ceramics.

Iron metal oxide containing secondary phases of sintered ceramic, e.g. Fe_2O_3 (hematite) or iron metal oxide containing mixed oxides, e.g. Ni-Zn ferrite ($MnaZn_{(1-a)}Fe_2O_4$).

References

Limiting references

This place does not cover:

The use of unburned red mud for making clay objects	C04B 33/1322

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: iron oxide	C04B 14/308
Eliminating lime or iron from clay mixtures	C04B 33/10
Ceramics based on iron oxide	C04B 35/26
iron aluminate ($Fe(AlO_2)_2$ starting material or secondary phase	C04B 2235/3272, C04B 2235/3222

iron titanate ($FeTiO_3$) starting material or secondary phase	C04B 2235/3272, C04B 2235/3234
iron chromate ($FeCrO_3$) starting material or secondary phase	C04B 2235/3272, C04B 2235/3243
iron chromite (called chromite, $FeCr_2O_4$) starting material or secondary phase	C04B 2235/3272, C04B 2235/3243
iron zirconate (Fe_2ZrO_5) starting material or secondary phase	C04B 2235/3272, C04B 2235/3248
lead iron niobate ($PbFe_{1/2}Nb_{1/2}O_3$) starting material or secondary phase	C04B 2235/3272, C04B 2235/3255, C04B 2235/3296 (Pb)
iron molybdate ($Fe_2(MoO_4))_3$) starting material or secondary phase	C04B 2235/3272, C04B 2235/3256
iron tungstate, ferberite, ($FeWO_4$) starting material or secondary phase	C04B 2235/3272, C04B 2235/326
iron manganite ($FeMn_2O_4$) starting material or secondary phase	C04B 2235/3272, C04B 2235/3268
iron cobaltite ($Co_xFe_{3-x}O_4$) starting material or secondary phase	C04B 2235/3272, C04B 2235/3275
iron borate (Fe_3BO_6) starting material or secondary phase	C04B 2235/3409, C04B 2235/3272
iron silicate (fayalite Fe_2SiO_4) starting material or secondary phase	C04B 2235/3427, C04B 2235/3272
Iron oxide containing glass starting material or secondary phase	C04B 2235/36
Iron boride (Fe_2B, FeB) starting material or secondary phase	C04B 2235/3804
Iron carbide (Fe_3C) starting material or secondary phase	C04B 2235/3817
Iron silicide (FeSi, $FeSi_2$) starting material or secondary phase	C04B 2235/3891
Iron starting material or secondary phase	C04B 2235/405
iron nitrate ($Fe(NO_3)_3$) starting material or secondary phase	C04B 2235/443, C04B 2235/3232
The preparation of iron compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 49/00 and subgroups

C04B 2235/3274

Ferrites

Definition statement

This place covers:

All oxidic ferrites, combinations between Fe_2O_3 and other oxides, such as FeO, ZnO, MnO, BaO, NiO, CoO, Co_3O_4, CuO, MgO, SrO, CaO

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: ferrites	C04B 14/363
Ceramics based on ferrites	C04B 35/26 and subgroups
Coating or impregnating ceramic substrates with ferrite	C04B 41/5036
The preparation of iron compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds being mixed oxides or hydroxides, e.g. ferrites	C01G 49/0018 and subgroups
The preparation of iron compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds containing, besides iron, two or more other elements, with the exception of oxygen or hydrogen	C01G 49/009

C04B 2235/3275

Cobalt oxides, cobaltates or cobaltites or oxide forming salts thereof, e.g. bismuth cobaltate, zinc cobaltite

Definition statement

This place covers:

Cobalt oxides, e.g. Co_2O_3 or CoO, cobalt oxide containing mixed oxides, e.g. cobalt ferrite ($CoFe_2O_4$), cobalt oxide containing clay, cobalt oxide containing silicates, Co_2SiO_4), cobalt salts, e.g. cobalt oxalate (CoC_2O_4), cobalt metal containing salts, all used as starting material for making ceramics.

Cobalt metal oxide containing secondary phases of sintered ceramic, e.g. CoO or cobalt metal oxide containing mixed oxides, e.g. cobalt perrhenate ($Co(ReO_4)_4$).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on cobalt oxide or cobaltates	C04B 35/01
Compositions containing one or more ferrites of the group comprising manganese, zinc, nickel, copper or cobalt and one or more ferrites of the group comprising rare earth metals, alkali metals, alkaline earth metals or lead	C04B 35/2608 and subgroups
Compositions containing one or more ferrites of the group comprising manganese, zinc and one or more ferrites of the group comprising nickel, copper or cobalt	C04B 35/265
Other ferrites containing nickel, copper or cobalt	C04B 35/2666
cobalt orthoarsenate ($Co_3(AsO_4)_2$) starting material or secondary phase	C04B 2235/3275, C04B 2235/34

cobalt selenate ($CoSeO_4$) starting material or secondary phase	C04B 2235/3275, C04B 2235/34
cobalt aluminate, thenard's blue, ($CoAl_2O_4$) starting material or secondary phase	C04B 2235/3275, C04B 2235/3222
cobalt titanate (Co_2TiO_4) starting material or secondary phase	C04B 2235/3275, C04B 2235/3234
cobalt vanadate ($Co_2V_2O_7$) starting material or secondary phase	C04B 2235/3275, C04B 2235/3239
cobalt chromate ($CoCrO_4$) starting material or secondary phase	C04B 2235/3275, C04B 2235/3243
cobalt chromite ($CoCr_2O_4$) starting material or secondary phase	C04B 2235/3275, C04B 2235/3243
cobalt zirconate ($CoZrO_3$) starting material or secondary phase	C04B 2235/3275, C04B 2235/3248
cobalt niobate ($CoNb_2O_6$) starting material or secondary phase	C04B 2235/3275, C04B 2235/3255
cobalt molybdate ($CoMoO_4$) starting material or secondary phase	C04B 2235/3275, C04B 2235/3256
cobalt tungstate, ($CoWO_4$) starting material or secondary phase	C04B 2235/3275, C04B 2235/326
cobalt manganite ($CoMn_2O_4$) starting material or secondary phase	C04B 2235/3275, C04B 2235/3268
cobalt perrhenate ($Co(ReO_4)_4$) starting material or secondary phase	C04B 2235/3275, C04B 2235/3268
cobalt ferrite ($CoFe_2O_4$) starting material or secondary phase	C04B 2235/3275, C04B 2235/3274
cobalt orthostannate (Co_2SnO_4) starting material or secondary phase	C04B 2235/3275, C04B 2235/3293
cobalt silicate (Co_2SiO_4) starting material or secondary phase	C04B 2235/3427, C04B 2235/3275
Cobalt oxide containing glass starting material or secondary phase	C04B 2235/36
Cobalt boride (CoB) starting material or secondary phase	C04B 2235/3804
Cobalt carbide (CoC) starting material or secondary phase	C04B 2235/3817
Cobalt silicide (Co_2Si, CoSi, $CoSi_2$) starting material or secondary phase	C04B 2235/3891
Cobalt starting material or secondary phase	C04B 2235/405
cobalt selenide (CoSe) starting material or secondary phase	C04B 2235/446, C04B 2235/3275
cobalt phosphate ($Co_3(PO_4)_2$) starting material or secondary phase	C04B 2235/447, C04B 2235/3275
The preparation of cobalt compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 51/00 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing iron, nickel and cobalt	C09K 11/60 and subgroups

C04B 2235/3277

Co_3O_4

Definition statement

This place covers:

Co_3O_4 as starting material for making ceramics or as secondary phase in sintered ceramics.

C04B 2235/3279

Nickel oxides, nickalates, or oxide-forming salts thereof

Definition statement

This place covers:

Nickel oxides, e.g. NiO, nickel oxide containing mixed oxides, e.g. nickel ferrite ($NiFe_2O_4$), nickel oxide containing clay, nickel oxide containing silicates, Ni_2SiO_4), nickel salts, e.g. nickel fluosilicate ($NiSiF_6$), nickel metal containing salts, all used as starting material for making ceramics.

Nickel metal oxide containing secondary phases of sintered ceramic, e.g. NiO or nickel metal oxide containing mixed oxides, e.g. nickel orthoarsenate ($Ni_3(AsO_4)_2$)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on nickel or nickelates	C04B 35/01
Compositions containing one or more ferrites of the group comprising manganese, zinc, nickel, copper or cobalt and one or more ferrites of the group comprising rare earth metals, alkali metals, alkaline earth metals or lead	C04B 35/2608 and subgroups
Compositions containing one or more ferrites of the group comprising manganese, zinc and one or more ferrites of the group comprising nickel, copper or cobalt	C04B 35/265
Other ferrites containing nickel, copper or cobalt	C04B 35/2666
nickel orthoarsenate ($Ni_3(AsO_4)_2$) starting material or secondary phase	C04B 2235/3279, C04B 2235/34
nickel selenate ($NiSeO_4$) starting material or secondary phase	C04B 2235/3279, C04B 2235/34
nickel aluminate, ($NiAl_2O_4$) starting material or secondary phase	C04B 2235/3279, C04B 2235/3222
nickel titanate ($NiTiO_3$) starting material or secondary phase	C04B 2235/3279, C04B 2235/3234
nickel vanadate ($Ni_2V_2O_7$) starting material or secondary phase	C04B 2235/3279, C04B 2235/3239
nickel chromate ($NiCrO_4$) starting material or secondary phase	C04B 2235/3279, C04B 2235/3243
nickel chromite ($NiCr_2O_4$) starting material or secondary phase	C04B 2235/3279, C04B 2235/3243

nickel zirconate ($NiZrO_3$) starting material or secondary phase	C04B 2235/3279, C04B 2235/3248
nickel niobate ($NiNb_2O_6$) starting material or secondary phase	C04B 2235/3279, C04B 2235/3255
nickel molybdate ($NiMoO_4$) starting material or secondary phase	C04B 2235/3279, C04B 2235/3256
nickel tungstate, ($NiWO_4$) starting material or secondary phase	C04B 2235/3279, C04B 2235/326
nickel manganite ($NiMn_2O_4$) starting material or secondary phase	C04B 2235/3279, C04B 2235/3268
nickel perrhenate ($Ni(ReO_4)_2$) starting material or secondary phase	C04B 2235/3279, C04B 2235/3268
nickel ferrite ($NiFe_2O_4$) starting material or secondary phase	C04B 2235/3279, C04B 2235/3274
sodium nickel cobaltate ($Na_{0.9}Co_{0.99}Ni_{0.01}O_2$) starting material or secondary phase	C04B 2235/3279, C04B 2235/3275, C04B 2235/3201 (Na)
nickel cuprate ($NiCuO_2$) starting material or secondary phase	C04B 2235/3279, C04B 2235/3281
nickel germanate (Ni_2GeO_4) starting material or secondary phase	C04B 2235/3279, C04B 2235/3287
nickel stannate ($NiSnO_3$) starting material or secondary phase	C04B 2235/3279, C04B 2235/3293
nickel antimonate ($NiSb_2O_6$) starting material or secondary phase	C04B 2235/3279, C04B 2235/3294
nickel silicate (Ni_2SiO_4) starting material or secondary phase	C04B 2235/3427, C04B 2235/3279
Nickel oxide containing glass starting material or secondary phase	C04B 2235/36
Nickel boride (NiB) starting material or secondary phase	C04B 2235/3804
Nickel carbide (Ni_3C) starting material or secondary phase	C04B 2235/3817
Nickel silicide (Ni_2Si) starting material or secondary phase	C04B 2235/3891
Nickel starting material or secondary phase	C04B 2235/405
nickel selenide (NiSe) starting material or secondary phase	C04B 2235/446, C04B 2235/3279
nickel phosphate ($Ni_3(PO_4)_2$) starting material or secondary phase	C04B 2235/447, C04B 2235/3279
The preparation of nickel compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 53/00 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing iron, nickel and cobalt	C09K 11/60 and subgroups

C04B 2235/3281

Copper oxides, cuprates or oxide-forming salts thereof, e.g. CuO or Cu_2O

Definition statement

This place covers:

Copper oxides, e.g. Cu_2O, copper oxide containing mixed oxides, e.g. copper dichromate ($CuCr_3O_7$), copper oxide containing clay, copper oxide containing silicates, $CuSiO_3$), copper salts, e.g. copper formate ($CuCHO_2$), copper metal containing salts, all used as starting material for making ceramics.

Copper metal oxide containing secondary phases of sintered ceramic, e.g. CuO or copper metal oxide containing mixed oxides, e.g. copper chromite ($Cu_2(Cr_2O_4)$).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: copper oxides	C04B 14/309
Compositions containing one or more ferrites of the group comprising manganese, zinc, nickel, copper or cobalt and one or more ferrites of the group comprising rare earth metals, alkali metals, alkaline earth metals or lead	C04B 35/2608 and subgroups
Compositions containing one or more ferrites of the group comprising manganese, zinc and one or more ferrites of the group comprising nickel, copper or cobalt	C04B 35/265
Other ferrites containing nickel, copper or cobalt	C04B 35/2666
Ceramics based on copper oxide	C04B 35/45
Making fibres based on copper oxide	C04B 35/62254
Coating or impregnating ceramic substrates with copper oxide ceramic material	C04B 41/5074 and subgroups
copper orthoarsenate ($Cu_3(AsO_4)_2$) starting material or secondary phase	C04B 2235/3281, C04B 2235/34
copper selenate ($CuSeO_4$) starting material or secondary phase	C04B 2235/3281, C04B 2235/34
copper aluminate, ($CuAl_2O_4$) starting material or secondary phase	C04B 2235/3281, C04B 2235/3222
copper titanate ($CuTiO_3$) starting material or secondary phase	C04B 2235/3281, C04B 2235/3234
copper vanadate (CuV_2O_6) starting material or secondary phase	C04B 2235/3281, C04B 2235/3239
copper chromate ($CuCrO_4$) starting material or secondary phase	C04B 2235/3281, C04B 2235/3243
copper chromite ($CuCr_2O_4$) starting material or secondary phase	C04B 2235/3281, C04B 2235/3243
copper zirconate ($CuZrO_3$) starting material or secondary phase	C04B 2235/3281, C04B 2235/3248

copper niobate ($CuNb_2O_6$) starting material or secondary phase	C04B 2235/3281, C04B 2235/3255
copper molybdate ($CuMoO_4$) starting material or secondary phase	C04B 2235/3281, C04B 2235/3256
copper tungstate, ($CuWO_4$) starting material or secondary phase	C04B 2235/3281, C04B 2235/326
copper manganite ($Cu_xMn_{3-x}O_4$) starting material or secondary phase	C04B 2235/3281, C04B 2235/3268
Lanthanum Copper Manganate (La_2CuMnO_6) starting material or secondary phase	C04B 2235/3281, C04B 2235/3268, C04B 2235/3227 (La)
copper perrhenate (Cu(ReO4)2) starting material or secondary phase	C04B 2235/3281, C04B 2235/3268
copper ferrite ($CuFe_2O_4$) starting material or secondary phase	C04B 2235/3281, C04B 2235/3274
Copper cobaltite $Cu_x(Co_{3-x}O_4)$ starting material or secondary phase	C04B 2235/3281, C04B 2235/3275
copper germanate ($CuGeO_3$) starting material or secondary phase	C04B 2235/3281, C04B 2235/3287
copper stannate ($CuSnO_3$) starting material or secondary phase	C04B 2235/3281, C04B 2235/3293
copper silicate ($CuSiO_3$) starting material or secondary phase	C04B 2235/3427, C04B 2235/3281
Copper oxide containing glass starting material or secondary phase	C04B 2235/36
Copper boride (Cu_3B_2) starting material or secondary phase	C04B 2235/3804
Copper carbide (Cu_2C) starting material or secondary phase	C04B 2235/3817
Copper nitride (Cu_3N) starting material or secondary phase	C04B 2235/3852
Copper silicide (Cu_4Si) starting material or secondary phase	C04B 2235/3891
Copper starting material or secondary phase	C04B 2235/405
copper selenide (CuSe) starting material or secondary phase	C04B 2235/446, C04B 2235/3281
copper phosphate ($Cu_3(PO_4)_2$) starting material or secondary phase	C04B 2235/447, C04B 2235/3281
The preparation of copper compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 3/00 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing copper, silver or gold	C09K 11/58 and subgroups

C04B 2235/3282

Cuprates

Definition statement

This place covers:

Cuprates, e.g. $YBa_2Cu_3O_7$ (YBCO) cuprate used as starting material for making ceramics.

Cuprate containing secondary phases of a sintered ceramic, e.g. nickel cuprate ($NiCuO_2$).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on rare earth oxide containing cuprates.	C04B 35/4504 and subgroups
Ceramics based on thallium oxide containing cuprates.	C04B 35/4512 and subgroups
Ceramics based on bismuth oxide containing cuprates	C04B 35/4521 and subgroups
The preparation of copper compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates, the compounds containing, besides copper, two or more other elements, with the exception of oxygen or hydrogen	C01G 3/006

C04B 2235/3284

Zinc oxides, zincates, cadmium oxides, cadmiates, mercury oxides, mercurates or oxide forming salts thereof

Definition statement

This place covers:

Zinc oxide, cadmium oxide or mercury oxides, e.g. CdO, HgO, zinc oxide, cadmium oxide or mercury oxide containing mixed oxides, e.g. mercury tungstate (Hg_2WO_4), zinc oxide, cadmium oxide or mercury oxide containing clay, zinc oxide, cadmium oxide or mercury oxide containing silicates, e.g. $CdSiO_3$, zinc, cadmium or mercury salts, e.g. zinc tetrabromide ($ZnBr_4$), zinc, cadmium or mercury containing salts, all used as starting material for making ceramics.

Zinc, cadmium or mercury oxide containing secondary phases of sintered ceramic, e.g. ZnO or zinc, cadmium or mercury oxide containing mixed oxides, e.g. zinc tellurate (Zn_3TeO_6).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Compositions containing one or more ferrites of the group comprising manganese, zinc, nickel, copper or cobalt and one or more ferrites of the group comprising rare earth metals, alkali metals, alkaline earth metals or lead	C04B 35/2608 and subgroups
Compositions containing one or more ferrites of the group comprising manganese, zinc and one or more ferrites of the group comprising nickel, copper or cobalt	C04B 35/265
Other ferrites containing manganese or zinc, e.g. Mn-Zn ferrites	C04B 35/2658
Ceramics based on zinc oxides	C04B 35/453
Cadmium hydrogen arsenate ($CdH(AsO_4)$) starting material or secondary phase	C04B 2235/3284, C04B 2235/34
cadmium selenate ($CdSeO_4$), zinc selenate ($ZnSeO_4$) starting material or secondary phase	C04B 2235/3284, C04B 2235/34

Mercury tellurate (Hg_3TeO_6), zinc tellurate (Zn_3TeO_6) starting material or secondary phase	C04B 2235/3284, C04B 2235/34
Zinc aluminate, gahnite ($ZnAl_2O_4$) starting material or secondary phase	C04B 2235/3284, C04B 2235/3222
Zinc titanate ($ZnTiO_3$) starting material or secondary phase	C04B 2235/3284, C04B 2235/3234
Zinc vanadate (ZnV_2O_6) starting material or secondary phase	C04B 2235/3284, C04B 2235/3239
Mercury chromate ($HgCrO_4$), zinc chromate ($ZnCrO_4$), starting material or secondary phase	C04B 2235/3284, C04B 2235/3243
Cadmium chromite ($CdCr_2O_4$) starting material or secondary phase	C04B 2235/3284, C04B 2235/3243
zinc zirconate ($ZnZrO_3$) starting material or secondary phase	C04B 2235/3284, C04B 2235/3248
zinc niobate ($ZnNb_2O_6$) starting material or secondary phase	C04B 2235/3284, C04B 2235/3255
Cadmium molybdate ($CdMoO_4$) starting material or secondary phase	C04B 2235/3284, C04B 2235/3256
cadmium tungstate, ($CdWO_4$), mercury tungstate, ($HgWO_4$), starting material or secondary phase	C04B 2235/3284, C04B 2235/326
Cadmium permanganate ($Cd(MnO_4)_2$), zinc permanganate ($Zn(MnO_4)_2$) starting material or secondary phase	C04B 2235/3284, C04B 2235/3268
zinc ferrite ($ZnFe_2O_4$) starting material or secondary phase	C04B 2235/3284, C04B 2235/3274
Zinc cobaltite ($ZnCo_2O_4$) starting material or secondary phase	C04B 2235/3284, C04B 2235/3275
Zinc gallate ($ZnGa_2O_4$) starting material or secondary phase	C04B 2235/3284, C04B 2235/3286
Zinc stannate (Zn_2SnO_4) starting material or secondary phase	C04B 2235/3284, C04B 2235/3293
zinc antimonate ($ZnSb_2O_6$) starting material or secondary phase	C04B 2235/3284, C04B 2235/3294
zinc bismuthate ($Zn(BiO_3)_2$) starting material or secondary phase	C04B 2235/3284, C04B 2235/3298
Cadmium borate $(Cd(BO)_3)2$, zinc borate $(ZnO)_3(B_2O_3)_2$ starting material or secondary phase	C04B 2235/3284, C04B 2235/3409
cadmium metasilicate ($CdSiO_3$), zinc metasilicate ($ZnSiO_3$), zinc orthosilicate, willemite (Zn_2SiO_4), starting material or secondary phase	C04B 2235/3427, C04B 2235/3284
Zinc, cadmium or mercury oxide containing glass starting material or secondary phase	C04B 2235/36
Zinc carbide (ZnC) starting material or secondary phase	C04B 2235/3817
Mercury nitride (Hg_3N_2), zinc nitride (Zn_3N_2) starting material or secondary phase	C04B 2235/3852
Zinc starting material or secondary phase	C04B 2235/40
Zinc selenide (ZnSe) starting material or secondary phase	C04B 2235/446, C04B 2235/3284

Cadmium orthophosphate ($Cd_3(PO_4)_2$), zinc orthophosphate ($Zn_3(PO_4)_2$) starting material or secondary phase	C04B 2235/447, C04B 2235/3284
Cadmium acetate ($Cd(C_2H_3O_2)_2$) starting material or secondary phase	C04B 2235/449, C04B 2235/3284
The preparation of zinc compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 9/00 and subgroups
The preparation of cadmium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 11/00
The preparation of mercury compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 13/00
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: compounds of cadmium	C09C 1/10, C09C 1/10 and subgroup

C04B 2235/3286

Gallium oxides, gallates, indium oxides, indates, thallium oxides, thallates or oxide forming salts thereof, e.g. zinc gallate

Definition statement

This place covers:

Gallium oxide, indium oxide or thallium oxides, e.g. Ga_2O_3, gallium oxide, indium oxide or thallium oxide containing mixed oxides, e.g. gallium selenate ($Ga_2(SeO_4)_3$), gallium oxide, indium oxide or thallium oxide containing clay, gallium oxide, indium oxide or thallium oxide containing silicates, e.g. lanthanum gallium silicate, $La_3Ga_5SiO_{14}$, gallium, indium or thallium salts, e.g. gallium nitrate ($Ga(NO_3)_3$), gallium, indium or thallium containing salts, all used as starting material for making ceramics.

Gallium, indium or thallium oxide containing secondary phases of sintered ceramic, e.g. InO, $Tl2O_2$ or gallium, indium or thallium oxide containing mixed oxides, e.g. thallium molybdate (Tl_2MoO_4).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

The preparation of gallium, indium or thallium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 15/00 and subgroups
Gallium, indium or thallium based ceramics	C04B 35/01
Ceramics based on thallium oxide containing cuprates.	C04B 35/4512 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing gallium, indium or thallium	C09K 11/62 and subgroups
Gallium selenate ($Ga_2(SeO_4)_3$), indium selenate ($In_2(SeO_4)_3$), thallium selenate (Tl_2SeO_4) starting material or secondary phase	C04B 2235/3286, C04B 2235/34
Indium titanate (In_2TiO_5) starting material or secondary phase	C04B 2235/3286, C04B 2235/3234
Thallium metavanadate ($TlVO_3$) starting material or secondary phase	C04B 2235/3286, C04B 2235/3239

Thallium chromate (Tl_2CrO_4), starting material or secondary phase	C04B 2235/3286, C04B 2235/3243
Lead indium-niobate $Pb(In_{1/2}Nb_{1/2})O_3$ starting material or secondary phase	C04B 2235/3286, C04B 2235/3255, C04B 2235/3296
Thallium molybdate (Tl_2MoO_4) starting material or secondary phase	C04B 2235/3286, C04B 2235/3256
Indium Tungstate, $In_2(WO_4)_3$ starting material or secondary phase	C04B 2235/3286, C04B 2235/326
nickel-zinc-indium ferrite (NZIFO)($Ni_{0.58}Zn_{0.42}In_xFe_{2-x}O_4$)) starting material or secondary phase	C04B 2235/3286, C04B 2235/3274, C04B 2235/3279 (Ni), C04B 2235/3284 (Zn)
Gallium ferrite ($GaFeO_3$) starting material or secondary phase	C04B 2235/3286, C04B 2235/3274
1222-Type Thallium-Indium Layered Cuprates $(Tl,In)Sr_2(Nd,Ce)_2Cu_2Oz$ starting material or secondary phase	C04B 2235/3286, C04B 2235/3282, C04B 2235/3213 (Sr), C04B 2235/3224 (Nd), C04B 2235/3229 (Ce)
$GaSr_2YCu_2Oz$ cuprate starting material or secondary phase	C04B 2235/3286, C04B 2235/3282, C04B 2235/3213 (Sr), C04B 2235/3225 (Y)
Gallium stannate (Ga_4SnO_8) starting material or secondary phase	C04B 2235/3286, C04B 2235/3293
$Ba_3Ga_2Ge_4O_{14}$ germanate starting material or secondary phase	C04B 2235/3286, C04B 2235/3287, C04B 2235/3215 (Ba)
Gallium or indium antimonate ($GaSbO_4$ or $InSbO_4$) starting material or secondary phase	C04B 2235/3286, C04B 2235/3294
Bismuth gallium oxide ($Bi_2Ga_4O_9$) starting material or secondary phase	C04B 2235/3286, C04B 2235/3298
Gallium borate ($GaBO_3$), indium borate ($InBO_3$) starting material or secondary phase	C04B 2235/3286, C04B 2235/3409
lanthanum gallium silicate, $La_3Ga_5SiO_{14}$ starting material or secondary phase	C04B 2235/3427, C04B 2235/3286, C04B 2235/3227
Gallium, indium or thallium oxide containing glass starting material or secondary phase	C04B 2235/36
Gallium boride (GaB_{12}) starting material or secondary phase	C04B 2235/3804
Gallium indium nitride ($Ga_{1-x}In_xN$) starting material or secondary phase	C04B 2235/3852
Gallium silicide (Ga_3Si) starting material or secondary phase	C04B 2235/3891
Gallium, indium or thallium starting material or secondary phase	C04B 2235/40
Thallium nitrite ($Tl(NO_2)_2$) starting material or secondary phase	C04B 2235/44, C04B 2235/3286
Thallium sulphite (Tl_2SO_3) starting material or secondary phase	C04B 2235/44, C04B 2235/3286

C04B 2235/3287

Germanium oxides, germanates or oxide forming salts thereof, e.g. copper germanate

Definition statement

This place covers:

Germanium oxides, e.g. GeO, germanium oxide containing mixed oxides, e.g. nickel germanate (Ni_2GeO_4), germanium oxide containing clay, germanium oxide containing silicates, germanium salts, e.g. germanium sulphide (GeS_2), germanium metal containing salts, all used as starting material for making ceramics.

Germanium metal oxide containing secondary phases of sintered ceramic, e.g. GeO_2 or germanium metal oxide containing mixed oxides, e.g. copper germanate ($CuGeO_3$)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Barium germanium aluminate. $BaGeAl_6O_{12}$ starting material or secondary phase	C04B 2235/3287, C04B 2235/3222, C04B 2235/3215 (Ba)
Barium germanium titanate ($Ba_2Ge_2TiO_8$) starting material or secondary phase	C04B 2235/3287, C04B 2235/3234, C04B 2235/3215 (Ba)
$Ni_{1.25}Fe_{1.5}Ge_{0.25}O_4$ starting material or secondary phase	C04B 2235/3287, C04B 2235/3274,
Germanium cuprate $CuGeO_3$ starting material or secondary phase	C04B 2235/3287, C04B 2235/3282
Barium germanium gallate $BaGeGa_6O_{12}$ starting material or secondary phase	C04B 2235/3287, C04B 2235/3286, C04B 2235/3215 (Ba)
Bismuth germanium oxide ($Bi_4Ge_3O_{12}$) starting material or secondary phase	C04B 2235/3287, C04B 2235/3298
Germanium oxide containing glass starting material or secondary phase	C04B 2235/36
molybdenum germanium boride ($Mo_{1.7}Ge_{0.3}B$) starting material or secondary phase	C04B 2235/3804, C04B 2235/3813
Germanium carbide (GeC) starting material or secondary phase	C04B 2235/3817
Germanium nitride (Ge_3N_4) starting material or secondary phase	C04B 2235/3852
germanium silicide ($Si_{1-x}Ge_x$) starting material or secondary phase	C04B 2235/3891
Germanium starting material or secondary phase	C04B 2235/40
germanium iodide (GeI_4) starting material or secondary phase	C04B 2235/445, C04B 2235/3287
germanium selenide ($GeSe_2$) starting material or secondary phase	C04B 2235/446, C04B 2235/3287
The preparation of germanium compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 17/00 and subgroups

Luminescent, e.g. electroluminescent, chemiluminescent materials containing germanates	C09K 11/0844
Luminescent, e.g. electroluminescent, chemiluminescent materials containing germanium, tin or lead	C09K 11/66 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing arsenic, antimony or bismuth germanates	**C09K11/74E**
Luminescent, e.g. electroluminescent, chemiluminescent materials containing rare earth germinates	C09K 11/7707, C09K 11/7735, C09K 11/775, C09K 11/7775, C09K 11/7793

C04B 2235/3289

Noble metal oxides

Definition statement

This place covers:

Noble metal oxides, e.g. Au_2O_3, OsO_4, PtO, RuO_4, noble metal containing mixed oxides, noble metal oxide containing clay, noble metal oxide containing silicates, noble metal salts, e.g. iridium fluoride (IrF_6), rhodium nitrate $Rh(NO_3)_3$, noble metal containing salts, all used as starting material for making ceramics.

Noble metal oxide containing secondary phases of sintered ceramic, e.g. IrO_2, PdO, RhO_2 or noble metal oxide containing mixed oxides.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on noble metal oxides	C04B 35/01
Palladium selenate ($PdSeO_4$) starting material or secondary phase	C04B 2235/3289, C04B 2235/34
Scandium Iridium Boride ($Sc_3Ir_5B_2$) starting material or secondary phase	C04B 2235/3804
Gold carbide (Au_2C_2) starting material or secondary phase	C04B 2235/3817
Ruthenium nitride (RuN) starting material or secondary phase	C04B 2235/3852
Osmium silicide (Os_2Si_3) starting material or secondary phase	C04B 2235/3891
Noble metal starting material or secondary phase	C04B 2235/408
Ruthenium hydroxide ($Ru(OH)_2$) starting material or secondary phase	C04B 2235/44, C04B 2235/3289
Gold cyanide (AuCN) starting material or secondary phase	C04B 2235/44, C04B 2235/3289
Osmium telluride ($OsTe_2$) starting material or secondary phase	C04B 2235/446, C04B 2235/3289
Platinum pyrophosphate (PtP_2O_7) starting material or secondary phase	C04B 2235/447, C04B 2235/3289
The preparation of gold compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 7/00 and subgroups

The preparation of ruthenium, rhodium, palladium, osmium, iridium, or platinum compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 55/00 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing copper, silver or gold	C09K 11/58 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing platinum group metals	C09K 11/87

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

noble metals	ruthenium (Ru), rhodium (Rh), palladium (Pd), silver (Ag), Osmium (Os), iridium (Ir), Platinum (Pt), gold (Au)

C04B 2235/3291

Silver oxides

Definition statement

This place covers:

Silver oxides, e.g. Ag_2O_2, silver oxide containing mixed oxides, e.g. silver tellurite (Ag_2TeO_3), silver oxide containing clay, silver oxide containing silicates (Ag_2SiO_3), silver salts, e.g. silver bromate ($AgBrO_3$), silver metal containing salts, all used as starting material for making ceramics.

Silver metal oxide containing secondary phases of sintered ceramic, e.g. Ag_2O or silver metal oxide containing mixed oxides, e.g. silver selenate (Ag_2SeO_4)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on silver metal oxides	C04B 35/01
silver selenate (Ag_2SeO_4) starting material or secondary phase	C04B 2235/3291, C04B 2235/34
silver tellurite (Ag_2TeO_3) starting material or secondary phase	C04B 2235/3291, C04B 2235/34
silver aluminate, ($AgAlO_2$) starting material or secondary phase	C04B 2235/3291, C04B 2235/3222
silver vanadate ($AgVO_3$) starting material or secondary phase	C04B 2235/3291, C04B 2235/3239
silver chromate (Ag_2CrO_4) starting material or secondary phase	C04B 2235/3291, C04B 2235/3243
silver niobate ($AgNbO_3$) starting material or secondary phase	C04B 2235/3291, C04B 2235/3255
silver molybdate (Ag_2MoO_4) starting material or secondary phase	C04B 2235/3291, C04B 2235/3256
silver tungstate (Ag_2WO_4) starting material or secondary phase	C04B 2235/3291, C04B 2235/326

Silver permanganate ($AgMnO_4$) starting material or secondary phase	C04B 2235/3291, C04B 2235/3268
silver perrhenate ($AgReO_4$) starting material or secondary phase	C04B 2235/3291, C04B 2235/3268
silver ferrite ($AgFeO_2$) starting material or secondary phase	C04B 2235/3291, C04B 2235/3274
silver cuprate ($AgCuO_2$) starting material or secondary phase	C04B 2235/3291, C04B 2235/3282
silver germanate ($Ag_2Ge_2O_5$) starting material or secondary phase	C04B 2235/3291, C04B 2235/3287
silver stannate (Ag_2SnO_3) starting material or secondary phase	C04B 2235/3291, C04B 2235/3293
silver antimonate ($AgSbO_3$) starting material or secondary phase	C04B 2235/3291, C04B 2235/3294
silver plumbate ($Ag_5Pb_2O_6$) starting material or secondary phase	C04B 2235/3291, C04B 2235/3296
silver bismuthate ($AgBiO_3$) starting material or secondary phase	C04B 2235/3291, C04B 2235/3298
silver tetraborate ($Ag_2B_4O_7$) starting material or secondary phase	C04B 2235/3409, C04B 2235/3291
silver silicate (Ag_2SiO_3) starting material or secondary phase	C04B 2235/3427, C04B 2235/3291
Silver oxide containing glass starting material or secondary phase	C04B 2235/36
Silver boride (AgB_2) starting material or secondary phase	C04B 2235/3804
Silver carbide (Ag_2C_2) starting material or secondary phase	C04B 2235/3817
Silver nitride (AgN_3) starting material or secondary phase	C04B 2235/3852
Silver starting material or secondary phase	C04B 2235/408
silver carbonate (Ag_2CO_3) starting material or secondary phase	C04B 2235/442, C04B 2235/3291
Silver chlorite ($AgClO_2$) starting material or secondary phase	C04B 2235/444, C04B 2235/3291
Silver metaphosphate ($AgPO_3$) starting material or secondary phase	C04B 2235/447, C04B 2235/3291
The preparation of silver compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 5/00 and subgroups

C04B 2235/3293

Tin oxides, stannates or oxide forming salts thereof, e.g. indium tin oxide [ITO]

Definition statement

This place covers:

Tin oxides, e.g. SnO, tin oxide containing mixed oxides, e.g. manganese stannate ($MnSnO_3$), tin oxide containing clay, tin oxide containing silicates, e.g. $SnSi_2O_6$, tin salts, e.g. tin fluoride (SnF_4), tin metal containing salts, all used as starting material for making ceramics.

Tin metal oxide containing secondary phases of sintered ceramic, e.g. SnO_2 or tin metal oxide containing mixed oxides, e.g. silver stannate (Ag_2SnO_3)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on tin oxides	C04B 35/457
tin arsenate ($Sn_2As_2O_7$) starting material or secondary phase	C04B 2235/3293, C04B 2235/34
tin titanate (Sn_2TiO_4) starting material or secondary phase	C04B 2235/3293, C04B 2235/3239
tin chromate ($Sn(CrO_4)_2$) starting material or secondary phase	C04B 2235/3293, C04B 2235/3243
tin molybdate ($SnMo_2O_8$) starting material or secondary phase	C04B 2235/3293, C04B 2235/3256
tin tungstate ($SnWO_4$) starting material or secondary phase	C04B 2235/3293, C04B 2235/326
Nickel tin ferrite ($Ni_{1+x}Sn_xFe_{2-2x}O_4$) starting material or secondary phase	C04B 2235/3293, C04B 2235/3274, C04B 2235/3279 (Ni)
tin silicate ($SnSi_2O_6$) starting material or secondary phase	C04B 2235/3427, C04B 2235/3293
Tin oxide containing glass starting material or secondary phase	C04B 2235/36
Tin nitride (SnN) starting material or secondary phase	C04B 2235/3852
Tin starting material or secondary phase	C04B 2235/40
Tin monophosphide (SnP) starting material or secondary phase	C04B 2235/44, C04B 2235/3293
tin sulphide (SnS) starting material or secondary phase	C04B 2235/446, C04B 2235/3293
Tin metaphosphate ($Sn(PO_3)_2$) starting material or secondary phase	C04B 2235/447, C04B 2235/3293
Luminescent, e.g. electroluminescent, chemiluminescent materials containing germanium, tin or lead	C09K 11/66 and subgroups

C04B 2235/3294

Antimony oxides, antimonates, antimonites or oxide forming salts thereof, indium antimonate

Definition statement

This place covers:

Antimony oxides, e.g. Sb_2O_3, antimony oxide containing mixed oxides, e.g. nickel antimonate ($NiSb_2O_6$), antimony oxide containing clay, antimony oxide containing silicates, antimony salts, e.g. antimony iodosulfide (SbSI), antimony metal containing salts, all used as starting material for making ceramics.

Antimony metal oxide containing secondary phases of sintered ceramic, e.g. Sb_2O_5 or antimony metal oxide containing mixed oxides, e.g. gallium or indium antimonate ($GaSbO_4$ or $InSbO_4$)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on antimony oxide	C04B 35/01
antimony aluminate, ($Sb_3Al_2O_4$) starting material or secondary phase	C04B 2235/3294, C04B 2235/3222
antimony vanadate ($Sb(VO_3)_3$) starting material or secondary phase	C04B 2235/3294, C04B 2235/3239
Doped PZT $Pb(Sb_{2/3}Mn_{1/3})_{0.08}(Zr_{0.52}Ti_{0.48})_{0.92}O_3$ starting material or secondary phase	C04B 2235/3294, C04B 2235/3249 (ZT), C04B 2235/3296 (Pb), C04B 2235/3262 (Mn)
antimony niobate ($SbNbO_4$) starting material or secondary phase	C04B 2235/3294, C04B 2235/3255
antimony molybdate ($KSbMo_2O_8$) starting material or secondary phase	C04B 2235/3294, C04B 2235/3256, C04B 2235/3201 (K)
antimony tungstate, ($CuWO_4$) starting material or secondary phase	C04B 2235/3294, C04B 2235/326
antimony germanate ($Sb_2Ge_3O_9$) starting material or secondary phase	C04B 2235/3294, C04B 2235/3287
Antimony oxide containing glass starting material or secondary phase	C04B 2235/36
Antimony carbide (SbC) starting material or secondary phase	C04B 2235/3817
Antimony nitride (SbN) starting material or secondary phase	C04B 2235/3852
Antimony starting material or secondary phase	C04B 2235/405
antimony selenide (Sb_2Se_3) starting material or secondary phase	C04B 2235/446, C04B 2235/3294
antimony oxysulphate ($Sb_2O_2SO_4$) starting material or secondary phase	C04B 2235/448, C04B 2235/3294
The preparation of antimony compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 30/00 and subgroups
Antimony oxide used as filler for polymers	C08K 3/2279
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: compounds of antimony	C09C 1/0096, C09C 1/0096
Luminescent, e.g. electroluminescent, chemiluminescent materials containing antimonates	C09K 11/0894
Luminescent, e.g. electroluminescent, chemiluminescent materials containing arsenic, antimony or bismuth	C09K 11/74 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing rare earth Antimonates; Arsenates	C09K 11/7714, C09K 11/7742, C09K 11/7782, C09K 11/7798

C04B 2235/3296

Lead oxides, plumbates or oxide forming salts thereof, e.g. silver plumbate

Definition statement

This place covers:

Lead oxides, e.g. Pb_2O_3, lead oxide containing mixed oxides, e.g. silver plumbate ($Ag_5Pb_2O_6$), lead oxide containing clay, lead oxide containing silicates, e.g. lead orthosilicate, barysilite ($Pb_2Si_2O_7$), lead salts, e.g. lead carbonate, cerussite ($PbCO_3$), lead containing salts, all used as starting material for making ceramics.

Lead oxide containing secondary phases of sintered ceramic, e.g. PbO_2 or lead oxide containing mixed oxides, e.g. lead iron niobate ($PbFe_{1/2}Nb_{1/2}O_3$).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Compositions containing one or more ferrites of the group comprising manganese, zinc, nickel, copper or cobalt and one or more ferrites of the group comprising rare earth metals, alkali metals, alkaline earth metals or lead	C04B 35/2608 and subgroups
Compositions containing one or more ferrites of the group comprising rare earth metals and one or more of the group comprising alkali metals, alkaline earth metals or lead	C04B 35/2641
Other ferrites containing alkaline earth metals or lead	C04B 35/2683
Ceramics based on thallium oxide containing cuprates, also containing lead oxide	C04B 35/4517
Ceramics based on bismuth oxide containing cuprates, also containing lead oxide	C04B 35/4525
Ceramics based on barium titanate perovskite, containing also lead	C04B 35/4684
Ceramics based on barium titanate non-perovskite, containing also lead	C04B 35/4688
Ceramics based on lead titanates	C04B 35/472
Ceramics based on zirconates-titanates, containing also lead	C04B 35/491 and subgroups
Ceramics based on vanadium, niobium, tantalum, molybdenum or tungsten oxides or solid solutions thereof with other oxides, e.g. vanadates, niobates, tantalates, molybdates or tungstates, based on solid solutions with lead	C04B 35/497 and subgroups
lead manganate ($PbMnO_3$) starting material or secondary phase	C04B 2235/3268, C04B 2235/3296
lead iron niobate ($PbFe_{1/2}Nb_{1/2}O_3$) starting material or secondary phase	C04B 2235/3272, C04B 2235/3255, C04B 2235/3296
Doped PZT $Pb(Sb_{2/3}Mn_{1/3})0.08(Zr_{0.52}Ti_{0.48})_{0.92}O_3$ starting material or secondary phase	C04B 2235/3294 (Sb), C04B 2235/3249 (ZT), C04B 2235/3296, C04B 2235/3262 (Mn)

lead orthoarsenate ($Pb_3(AsO_4)_2$) starting material or secondary phase	C04B 2235/3296, C04B 2235/34
lead selenate ($PbSeO_4$) starting material or secondary phase	C04B 2235/3296, C04B 2235/34
lead aluminate, ($PbAl_2O_4$) starting material or secondary phase	C04B 2235/3296, C04B 2235/3222
lead metatitanate ($PbTiO_3$) starting material or secondary phase	C04B 2235/3296, C04B 2235/3234
lead vanadate (PbV_2O_6) starting material or secondary phase	C04B 2235/3296, C04B 2235/3239
lead chromate, crocoite ($PbCrO_4$) starting material or secondary phase	C04B 2235/3296, C04B 2235/3243
lead molybdate, wulfenite ($PbMoO_4$) starting material or secondary phase	C04B 2235/3296, C04B 2235/3256
lead tungstate, ($PbWO_4$) starting material or secondary phase	C04B 2235/3296, C04B 2235/326
lead ferrite ($PbFe_2O_4$) starting material or secondary phase	C04B 2235/3296, C04B 2235/3274
Lead cobaltate ($PbCoO_3$, $PbCo_2O_4$) starting material or secondary phase	C04B 2235/3296, C04B 2235/3275
Lead cuprate ($Pb_2Sr_2NdCu_3O_8$) starting material or secondary phase	C04B 2235/3296, C04B 2235/3282, C04B 2235/3213 (Sr), C04B 2235/3224 (Nd),
lead germanate ($Pb_5Ge_3O_{11}$) starting material or secondary phase	C04B 2235/3296, C04B 2235/3287
lead stannate ($PbSnO_3$) starting material or secondary phase	C04B 2235/3296, C04B 2235/3293
lead diantimonate ($Pb_2Sb_2O_7$) starting material or secondary phase	C04B 2235/3296, C04B 2235/3293
lead metaborate ($Pb(BO_2)_2$) starting material or secondary phase	C04B 2235/3409, C04B 2235/3296
lead metasilicate, alamosite ($PbSiO_3$) starting material or secondary phase	C04B 2235/3427, C04B 2235/3296
Lead oxide containing glass starting material or secondary phase	C04B 2235/36
Lead nitride ($Pb(N_3)_2$) starting material or secondary phase	C04B 2235/3852
Lead starting material or secondary phase	C04B 2235/40
lead selenide, clausthalite (PbSe) starting material or secondary phase	C04B 2235/446, C04B 2235/3296
lead orthophosphate ($Pb_2(PO_4)_2$) starting material or secondary phase	C04B 2235/447, C04B 2235/3296
The preparation of lead compounds in powder form, e.g. oxides, carbonates, halides, nitrates, sulphates	C01G 19/00 and subgroups
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: compounds of lead	C09C 1/14, C09C 1/14 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing germanium, tin or lead	C09K 11/66 and subgroups

C04B 2235/3298

Bismuth oxides, bismuthates or oxide forming salts thereof, e.g. zinc bismuthate

Definition statement

This place covers:

Bismuth oxides, e.g. Bi_2O_3, bismuth oxide containing mixed oxides, e.g. zinc bismuthate ($Zn(BiO_3)_2$), bismuth oxide containing clay, bismuth oxide containing silicates, e.g. bismuth silicate, eulytite ($2Bi_2O_3$ $3SiO_2$), bismuth salts, e.g. bismuth hydroxide ($Bi(OH)_3$), bismuth containing salts, all used as starting material for making ceramics.

Bismuth oxide containing secondary phases of sintered ceramic, e.g. Bi_2O_5 or bismuth oxide containing mixed oxides, e.g. silver bismuthate ($AgBiO_3$).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on bismuth oxide containing cuprates	C04B 35/4521 and subgroups
Ceramics based on bismuth oxides	C04B 35/453
Ceramics based on bismuth titanates	C04B 35/475
barium strontium bismuth niobate ($Ba_{0.1}Sr_{0.9}Bi_2Nb_2O_9$) starting material or secondary phase	C04B 2235/3213 (Sr), C04B 2235/3215 (Ba), C04B 2235/3255, C04B 2235/3298
bismuth manganate ($Bi_{2.4}MnO_3$) starting material or secondary phase	C04B 2235/3268, C04B 2235/3298
bismuth manganite ($BiMnO_3$) starting material or secondary phase	C04B 2235/3268, C04B 2235/3298
Bismuth gallium oxide ($Bi_2Ga_4O_9$) starting material or secondary phase	C04B 2235/3286, C04B 2235/3298
Bismuth germanate ($Bi_4Ge_3O_{12}$) starting material or secondary phase	C04B 2235/3287, C04B 2235/3298
bismuth orthoarsenate ($BiAsO_4$) starting material or secondary phase	C04B 2235/3298, C04B 2235/34
bismuth tellurate, montanite (Bi_2TeO_6) starting material or secondary phase	C04B 2235/3298, C04B 2235/34
bismuth aluminate, ($BiAlO_3$) starting material or secondary phase	C04B 2235/3298, C04B 2235/3222
bismuth titanate ($Bi_4Ti_3O_{12}$) starting material or secondary phase	C04B 2235/3298, C04B 2235/3234
bismuth vanadate, pucherite (Bi_2O_3 V_2O_5)) starting material or secondary phase	C04B 2235/3298, C04B 2235/3239
bismuth dichromate ($(BiO_2)_2Cr_2O_7$) starting material or secondary phase	C04B 2235/3298, C04B 2235/3243
bismuth zirconate ($Bi_2Zr_2O_7$) starting material or secondary phase	C04B 2235/3298, C04B 2235/3248

bismuth molybdate ($Bi_2(MoO_4)_3$) starting material or secondary phase	C04B 2235/3298, C04B 2235/3256
bismuth tungstate, (Bi_2WO_6) starting material or secondary phase	C04B 2235/3298, C04B 2235/326
bismuth ferrite ($BiFeO_3$) starting material or secondary phase	C04B 2235/3298, C04B 2235/3274
Bismuth cobaltate ($BiCoO_3$) starting material or secondary phase	C04B 2235/3298, C04B 2235/3275
Bismuth cuprate (Bi_2CuO_4) starting material or secondary phase	C04B 2235/3298, C04B 2235/3282
bismuth stannate ($Bi_2Sn_3O_9$) starting material or secondary phase	C04B 2235/3298, C04B 2235/3293
bismuth metaborate ($Pb(BO_2)_2$) starting material or secondary phase	C04B 2235/3409, C04B 2235/3298
bismuth silicate, eulytite ($2Bi_2O_3$ $3SiO_2$) starting material or secondary phase	C04B 2235/3427, C04B 2235/3298
Bismuth oxide containing glass starting material or secondary phase	C04B 2235/36
Nickel bismuth boride ($Ni_{23-x}Bi_xB_6$) starting material or secondary phase	C04B 2235/3804
Bismuth nitride (BiN) starting material or secondary phase	C04B 2235/3852
Bismuth starting material or secondary phase	C04B 2235/40
bismuth selenide, juanajuatite (Bi_2Se_3) starting material or secondary phase	C04B 2235/446, C04B 2235/3298
bismuth orthophosphate ($BiPO_4$) starting material or secondary phase	C04B 2235/447, C04B 2235/3298
Luminescent, e.g. electroluminescent, chemiluminescent materials containing arsenic, antimony or bismuth	C09K 11/74 and sub-classes

C04B 2235/34

Non-metal oxides, non-metal mixed oxides, or salts thereof that form the non-metal oxides upon heating, e.g. carbonates, nitrates, (oxy)hydroxides, chlorides

Definition statement

This place covers:

All oxides of non-metals, such as B, Ar, Se, Te or Si, mixed oxides based on these non-metals, e.g. arsenates such as cobalt orthoarsenate ($Co_3(AsO_4)_2$), selenates such as zinc selenate ($ZnSeO_4$), tellurates such as bismuth tellurate, montanite (Bi_2TeO_6), or metal salts that convert to these oxides upon heating, used as starting material for making a ceramic or present as secondary phase in a sintered ceramic.

References

Limiting references

This place does not cover:

The oxides of the non-metal phosphor	C04B 2235/447
Oxide compounds of the non-metal sulphur	C04B 2235/448

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on arsenates, selenates or tellurates	C04B 35/01
Ceramics based on phosphates	C04B 35/447
Ceramics based on metal-phosphor compounds without oxygen, the phosphides	C04B 35/5154
Ceramics based on sulfides, selenides or tellurides	C04B 35/547
Metal arsenides, e.g. GaAs, as starting material for making ceramics	C04B 2235/44
Metal phosphides as starting material for making ceramics	C04B 2235/44
Metal sulphides, selenides or tellurides as starting material for making ceramics	C04B 2235/446
Products characterised by the absence or the low content of specific components, e.g. alkali metal free alumina ceramics	C04B 2235/72 and subgroups
Oxide interlayer used for joining a ceramic with another substrate	C04B 2237/06 and subgroups
Oxide substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/34 and subgroups

C04B 2235/3409

Boron oxide, borates, boric acids, or oxide forming salts thereof, e.g. borax

Definition statement

This place covers:

Boron oxides, e.g. B_2O_3, boric acids, e.g. HBO_2, boron oxide containing mixed oxides, e.g. boron arsenate ($BAsO_4$), boron oxide containing clay, boron oxide containing silicates, e.g. Danburite, $CaB_2Si_2O_8$, boron salts, e.g. boron bromide (BBr_3), boron containing salts, all used as starting material for making ceramics.

Boron oxide containing secondary phases of a sintered ceramic, e.g. B_2O_3 or boron oxide containing mixed oxides, e.g. silver tetraborate ($Ag_2B_4O_7$).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on boron oxide	C04B 35/01
boron arsenate ($BAsO_4$) starting material or secondary phase	C04B 2235/3409, C04B 2235/34
boron aluminate • $Al_4B_2O_9$ starting material or secondary phase	C04B 2235/3409, C04B 2235/3222
boron titanate (BTi_3O_9) starting material or secondary phase	C04B 2235/3409, C04B 2235/3234
Borotungstic acid, ($H_5BW_{12}O_{40}$) starting material or secondary phase	C04B 2235/3409, C04B 2235/326
boron ferrite series $B_2O_3 \cdot Fe_2O_3 \cdot 4MeO$(Me = Mg, Ni, Co, Cu) starting material or secondary phase	C04B 2235/3409, C04B 2235/3274

Danburite, $CaB_2Si_2O_8$, calcium boron silicate starting material or secondary phase	C04B 2235/3427, C04B 2235/3409, C04B 2235/3208 (Ca)
Boron oxide containing glass starting material or secondary phase	C04B 2235/36
Boron oxide and silica containing glass starting material or secondary phase	C04B 2235/365
Boride starting material or secondary phase	C04B 2235/3804 and subgroups
Boron carbide (B_4C) starting material or secondary phase	C04B 2235/3821
Boron nitride (BN) starting material or secondary phase	C04B 2235/386
Boron silicide (B_6Si, B_2Si) starting material or secondary phase	C04B 2235/3891
Boron starting material or secondary phase	C04B 2235/421
boron hydride (B_2H_6) starting material or secondary phase	C04B 2235/44, C04B 2235/3409
boron phosphide (BP) starting material or secondary phase	C04B 2235/44, C04B 2235/3409
Making compounds containing boron and oxygen	C01B 35/10 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing borates	C09K 11/0877, C09K 11/647, C09K 11/667, C09K 11/678, C09K 11/687, C09K 11/708, C09K 11/7485, C09K 11/765, C09K 11/7712, C09K 11/7726, C09K 11/774, C09K 11/7755, C09K 11/778, C09K 11/7797, C09K 11/888

C04B 2235/3418

Silicon oxide, silicic acids, or oxide forming salts thereof, e.g. silica sol, fused silica, silica fume, cristobalite, quartz or flint (glass constituents C04B 2235/36)

Definition statement

This place covers:

Silicon oxides, e.g. crystalline silica such as quartz, cristobalite, tridymite, amorphous silica such as silica sol, silica fume, fused silica, silicic acids, e.g. $H_2Si_2O_5$, silicon salts, e.g. silicon bromide (Si_2Br_6), silicon containing salts, all used as starting material for making ceramics.

Silicon oxide containing secondary phases of a sintered ceramic.

References

Limiting references

This place does not cover:

Fused silica fibers used as additive for ceramics	C04B 35/82
Mixed oxides of silica and other metal oxides as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3427 and subgroups, C04B 2235/349
Silica or silicate fibers used in ceramic compositions	C04B 2235/5232

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: granular materials: quartz; sand	C04B 14/06 and subgroups
Silica fume waste material used for making clay wares	C04B 33/132
Lean materials, e.g. grog, quartz	C04B 33/16
Alumina based refractories containing zircon	C04B 35/106
Ceramic silica based materials	C04B 35/14
Ceramic silicate based materials	C04B 35/16 and subgroups
Making fibers based on silica	C04B 35/6224
Inorganic binders based on silicon compounds	C04B 35/6316
Coating or impregnating ceramic substrates with silica	C04B 41/5035
Silicon oxide containing glass starting material or secondary phase	C04B 2235/36 and subgroups
Silicon boride (SiBn) starting material or secondary phase	C04B 2235/3804
Boron silicide = silicon boride	C04B 2235/3804
Silicon carbide (SiC) starting material or secondary phase	C04B 2235/3826 and subgroups
Silicon nitride (Si_3N_4) starting material or secondary phase	C04B 2235/3873 and subgroups
Silicon starting material or secondary phase	C04B 2235/428
silicon fluoride (SiF_4) starting material or secondary phase	C04B 2235/445, C04B 2235/3418
silicon sulphide (SiS_2) starting material or secondary phase	C04B 2235/446, C04B 2235/3418
Silica or silicate interlayer used for joining a ceramic with another substrate	C04B 2237/062
Silica or silicate substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/341
Silica-based membranes	B01D 71/027
Catalysts comprising silica	B01J 21/08, B01J 21/08, C07C 2521/08

Preparation of silica powders, sols, gels, dispersions and their after-treatments	C01B 33/113 and subgroups
Processes specially adapted for the production of quartz or fused silica articles	C03B 20/00
Glass compositions with more than 90% silica by weight, e.g. quartz	C03C 3/06
Silica used as filler for polymers	C08K 3/36
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: compounds of silicon	C09C 1/28, C09C 1/28 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing silicon	C09K 11/59 and subgroups

C04B 2235/3427

Silicates other than clay, e.g. water glass

Definition statement

This place covers:

All silicates that are not clay (see C04B 2235/349 for the definition of clays). A silicate is a compound containing a silicon bearing anion. The great majority of silicates are oxides, but hexafluorosilicate ($[SiF_6]^{2-}$) and other anions are also included. Silicate compounds, including the minerals, consist of silicate anions whose charge is balanced by various cations. Myriad silicate anions can exist, and each can form compounds with many different cations. Hence this class of compounds is very large. Both minerals and synthetic materials fit in this class. Silicates are mainly a mixed oxide phase of SiO_2 with at least one other metal oxide, e.g. Willemite - Zn_2SiO_4, Fayalite - Fe_2SiO_4, Ferrosilite - $FeSiO_3$, Aegirine (Acmite) - $NaFe^{3+}Si_2O_6$, Rhodonite - $MnSiO_3$.

References

Limiting references

This place does not cover:

Zirconium or hafnium containing silicates, e.g. zircon ($ZrSiO_4$)	C04B 2235/3248
Silicon oxide, silicic acids, or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. silica sol, fused silica, silica fume, cristobalite, quartz or flint, e.g. silicic acid $H_2Si_2O_5$	C04B 2235/3418
Clay silicate starting materials or secondary phase of a sintered ceramic, e.g. illite	C04B 2235/349
Silica or silicate fibers used in ceramic compositions	C04B 2235/5232

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of silica-rich materials or silicates as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone	C04B 14/04 and subgroups
Clay wares	C04B 33/00 and subgroups

Ceramic silica based materials	C04B 35/14
Ceramic silicate based materials	C04B 35/16 and subgroups
Ceramics based on zircon	C04B 35/481
Inorganic binders based on silicon compounds	C04B 35/6316
Silica or silicate interlayer used for joining a ceramic with another substrate	C04B 2237/062
Silica or silicate substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/341
Preparation of silicate powders, sols, gels, dispersions and their after-treatments	C01B 33/20 and subgroups C01B 37/005
polysilicate macromolecular compounds	C08G 77/02, C08L 83/02
Coating compositions, e.g. paints, varnishes or lacquers, based on alkali metal silicates	C09D 1/02 and subgroups
Adhesives based on water-soluble alkali silicate	C09J 1/02
Luminescent, e.g. electroluminescent, chemiluminescent materials containing silicates	C09K 11/0838
Luminescent, e.g. electroluminescent, chemiluminescent materials containing iron, nickel and cobalt as silicate	C09K 11/607
Luminescent, e.g. electroluminescent, chemiluminescent materials containing inorganic halogen silicate compounds	C09K 11/617
Luminescent, e.g. electroluminescent, chemiluminescent materials containing germanium, tin or lead silicates	C09K 11/666
Luminescent, e.g. electroluminescent, chemiluminescent materials containing refractory silicates	C09K 11/676
Luminescent, e.g. electroluminescent, chemiluminescent materials containing chromium, molybdenum or tungsten silicates	C09K 11/685
Luminescent, e.g. electroluminescent, chemiluminescent materials containing vanadium silicates	C09K 11/698
Luminescent, e.g. electroluminescent, chemiluminescent materials containing arsenic, antimony or bismuth silicates	C09K 11/7442, C09K 11/757
Luminescent, e.g. electroluminescent, chemiluminescent materials containing rare earth silicates	C09K 11/7706, C09K 11/7721, C09K 11/7734, C09K 11/7749, C09K 11/7758, C09K 11/7764, C09K 11/7774, C09K 11/7792

Special rules of classification

The presence of the metal cations that combine with the silicate anion is indicate with symbols from the C04B 2235/32 scheme, e.g. C04B 2235/3284 to indicate the Zn of willemite, C04B 2235/3272 to indicate the Fe of fayalite.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Silicate mineral	Mineralogically, silicate minerals are divided according to structure of their silicate anion into the following groups: Nesosilicates (lone tetrahedron) - $[SiO_4]^{4-}$, e.g. olivine . Sorosilicates (double tetrahedra) - $[Si_2O_7]^{6-}$, e.g. epidote, melilite group. Cyclosilicates (rings) - $[Si_nO_{3n}]^{2n-}$, e.g. tourmaline group. Inosilicates (single chain) - $[Si_nO_{3n}]^{2n-}$, e.g. pyroxene group. Inosilicates(double chain) - $[Si_{4n}O_{11n}]^{6n-}$, e.g. amphibole group. Phyllosilicates (sheets) - $[Si_{2n}O_{5n}]^{2n-}$, e.g. micas and clays . Tectosilicates (3D framework) - $[Al_xSi_yO_{2(x+y)}]^{x-}$, e.g. quartz, feldspars, zeolites . Note that tectosilicates can only have additional cations if some of the silicon is replaced by a lower-charge cation such as aluminium . Al for Si substitution is common.

C04B 2235/3436

Alkaline earth metal silicates, e.g. barium silicate

Definition statement

This place covers:

Alkaline earth metal silicates used as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Benitoite - $BaTi(Si_3O_9)$, Phenakite - Be_2SiO_4

References

Limiting references

This place does not cover:

Alkaline earth metal silicates containing also aluminium oxide	C04B 2235/3481

Informative references

Attention is drawn to the following places, which may be of interest for search:

Alkaline earth oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. BeO	C04B 2235/3205 and subgroups

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

alkaline earth metal oxides	BeO, MgO, CaO, SrO, BaO, RaO

C04B 2235/3445

Magnesium silicates, e.g. forsterite

Definition statement

This place covers:

Magnesium silicates used as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Forsterite (Mg_2SiO_4), Humite group $(Mg,Fe)_7(SiO_4)_3(F,OH)_2$, Enstatite ($MgSiO_3$), Diopside ($CaMgSi_2O_6$), the Serpentine group

References

Limiting references

This place does not cover:

Magnesium silicates containing also aluminium oxide, e.g. mica	C04B 2235/3481
Clay starting material for making ceramics, such as talc ($Mg_3Si_4O_{10}(OH)_2$) or sepiolite ($Mg_4Si_6O_{15}(OH)_2 \cdot 6H_2O$)	**C04B235/34H**

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: magnesium silicates, e.g. talc, sepiolite	C04B 14/042
Mixed oxides of MgO with silica without alumina, e.g. forsterite (Mg_2SiO_4)	C04B 35/20
Magnesium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3206
Catalysts comprising silica and magnesia	B01J 21/14, B01J 21/14, C07C 2521/14
Preparation of magnesium silicate powders, sols, gels, dispersions and their after-treatments	C01B 33/22

Special rules of classification

If the alkaline earth silicate contains both Mg and Ca, such as with diopside ($CaMgSi_2O_6$), both C04B 2235/3445 and C04B 2235/3454 are given. If the alkaline earth silicate contains both Mg and Ba, Be or Sr, both C04B 2235/3445 and C04B 2235/3436 are given.

C04B 2235/3454

Calcium silicates, e.g. wollastonite

Definition statement

This place covers:

Calcium silicates used as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Datolite - $CaBSiO_4(OH)$, Titanite - $CaTiSiO_5$, Ilvaite - $CaFe_2+2Fe_3+O(Si_2O_7)(OH)$, Pigeonite - $Ca_{0.25}(Mg,Fe)_{1.75}Si_2O_6$, Diopside - $CaMgSi_2O_6$, Wollastonite - $CaSiO_3$, Tremolite - $Ca_2Mg_5Si_8O_{22}(OH)_2$

References

Limiting references

This place does not cover:

Magnesium silicates containing also aluminium oxide, e.g. mica	C04B 2235/3481
Talc ($Mg_3Si_4O_{10}(OH)_2$) starting material for making ceramics	C04B 2235/349

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: alkaline-earth metal silicates, e.g. wollastonite	C04B 14/043
calcium silicate based hydraulic cement	C04B 28/02 and subgroups
Mixed oxides of CaO with silica without alumina, e.g. wollastonite ($CaSiO_4$)	C04B 35/22
Calcium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. lime	C04B 2235/3208
Preparation of alkaline earth metal silicate powders, sols, gels, dispersions and their after-treatments	C01B 33/24
calcium silicates as compounding ingredient for polymers	C08K 3/34

Special rules of classification

If the alkaline earth silicate contains both Mg and Ca, such as with diopside ($CaMgSi_2O_6$), both C04B 2235/3445 and C04B 2235/3454 are given. If the alkaline earth silicate contains both Ca and Ba, Be or Sr, both C04B 2235/3454 and C04B 2235/3436 are given. A silicate such as Datolite - $CaBSiO_4(OH)$ also receives the symbol C04B 2235/3409.

C04B 2235/3463

Alumino-silicates other than clay, e.g. mullite

Definition statement

This place covers:

All silicates that are not clay (see C04B 2235/349 for the definition of clays) and also contain aluminium oxide, e.g. Almandine - $Fe_3Al_2(SiO_4)_3$, Andalusite - Al_2SiO_5, Kyanite - Al_2SiO_5, Sillimanite - Al_2SiO_5, Dumortierite - $Al_{6.5\text{-}7}BO_3(SiO_4)_3(O,OH)_3$, Topaz - $Al_2SiO_4(F,OH)_2$, Beryl/Emerald - $Be_3Al_2(Si_6O_{18})$

References

Limiting references

This place does not cover:

Clay silicate starting materials or secondary phase of a sintered ceramic	C04B 2235/349
Alumino-silicate fibers used in ceramic compositions	C04B 2235/5228

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: Aluminium silicates other than clay	C04B 14/041
Clay wares	C04B 33/00 and subgroups
Alumino-silicate based ceramics	C04B 35/18 and subgroups
Making fibres based on silica, rich in aluminium oxide	C04B 35/62245
Aluminates other than alumino-silicates as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. spinel ($MgAl_2O_4$)	C04B 2235/3222
Catalysts comprising silica and alumina	B01J 21/12, B01J 21/12, C07C 2521/12
Catalysts comprising Crystalline aluminosilicate zeolites; Isomorphous compounds thereof	B01J 29/06 and subgroups
Preparation of aluminium containing silicate powders, sols, gels, dispersions and their after-treatments	C01B 33/26 and subgroups
Compounds having molecular sieve and base-exchange properties, e.g. crystalline zeolites; Their preparation; After-treatment, e.g. ion-exchange or de-alumination	C01B 39/00 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing aluminium silicates	C09K 11/646

C04B 2235/3472

Alkali metal alumino-silicates other than clay, e.g. spodumene, alkali feldspars such as albite or orthoclase, micas such as muscovite, zeolites such as natrolite

Definition statement

This place covers:

All alkali metal silicates that are not clay (see C04B 2235/349 for the definition of clays) and also contain aluminium oxide, e.g.:

Tourmaline - $(Na,Ca)(Al,Li,Mg)_3$-$(Al,Fe,Mn)_6(Si_6O_{18})(BO_3)_3(OH)_4$

- Sodium pyroxene series
- - Jadeite - $NaAlSi_2O_6$
- - Aegirine (Acmite) - $NaFe^{3+}Si_2O_6$
- Spodumene - $LiAlSi_2O_6$
- Hornblende - $(Ca,Na)_{2-3}(Mg,Fe,Al)_5Si_6(Al,Si)_2O_{22}(OH)_2$
- Mica group
- - Biotite - $K(Mg,Fe)_3(AlSi_3)O_{10}(OH)_2$
- - Muscovite - $KAl_2(AlSi_3)O_{10}(OH)_2$
- - Phlogopite - $KMg_3(AlSi_3)O_{10}(OH)_2$

- - Lepidolite - $K(Li,Al)_{2-3}(AlSi_3)O_{10}(OH)_2$
- Alkali-feldspars
- - Potassium-feldspars
- -- Microcline - $KAlSi_3O_8$
- -- Orthoclase - $KAlSi_3O_8$
- -- Sanidine - $KAlSi_3O_8$
- - Anorthoclase - $(Na,K)AlSi_3O_8$
- - Plagioclase feldspars
- -- Albite - $NaAlSi_3O_8$
- -- Oligoclase - $(Na,Ca)(Si,Al)_4O_8$ (Na:Ca 4:1)
- -- Andesine - $(Na,Ca)(Si,Al)_4O_8$ (Na:Ca 3:2)
- -- Labradorite - $(Na,Ca)(Si,Al)_4O_8$ (Na:Ca 2:3)
- -- Bytownite - $(Na,Ca)(Si,Al)_4O_8$ (Na:Ca 1:4)
- Feldspathoid family
- - Nosean - $Na_8Al_6Si_6O_{24}(SO_4)$
- - Cancrinite - $Na_6Ca_2(CO_3,Al_6Si_6O_{24}).2H_2O$
- - Leucite - $KAlSi_2O_6$
- - Nepheline - $(Na,K)AlSiO_4$
- - Sodalite - $Na_8(AlSiO_4)_6Cl_2$
- -- Hauyne - $(Na,Ca)_4$-$8Al_6Si_6(O,S)24(SO_4,Cl)_1$-2
- - Lazurite - $(Na,Ca)_8(AlSiO_4)_6(SO_4,S,Cl)_2$
- Petalite - $LiAlSi_4O_{10}$
- Scapolite group
- - Marialite - $Na_4(AlSi_3O_8)_3(Cl_2,CO_3,SO_4)$
- Analcime - $NaAlSi_2O_6 \bullet H_2O$
- Zeolite group
- - Natrolite - $Na_2Al_2Si_3O_{10} \bullet 2H_2O$
- - Stilbite - $NaCa_2Al_5Si_{13}O_{36} \bullet 17H_2O$

References

Limiting references

This place does not cover:

Illite - $(K,H_3O)(Al,Mg,Fe)_2(Si,Al)_4O_{10}[(OH)_2,(H_2O)]$	C04B 2235/349
Montmorillonite - $(Na,Ca)_{0.33}(Al,Mg)_2Si_4O_{10}(OH)_2 \cdot nH_2O$	C04B 2235/349

Informative references

Attention is drawn to the following places, which may be of interest for search:

Alkali metal aluminosilicates based ceramics	C04B 35/19
Alkali oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Na_2O, K_2O	C04B 2235/3201 and subgroups

Special rules of classification

If the alumino-silicate contains both alkali and alkaline earth metals, both C04B 2235/3472 and C04B 2235/3481 are given. The presence of other oxides in the silicate is indicated with symbols from C04B 2235/32 - C04B 2235/3409.

C04B 2235/3481

Alkaline earth metal alumino-silicates other than clay, e.g. cordierite, beryl, micas such as margarite, plagioclase feldspars such as anorthite, zeolites such as chabazite

Definition statement

This place covers:

All alkaline earth metal silicates that are not clay (see C04B 2235/349 for the definition of clays) and also contain aluminium oxide, e.g.:

- Garnet group
- Pyrope - $Mg_3Al_2(SiO_4)_3$
- Grossular - $Ca_3Al_2(SiO_4)_3$
- Andradite - $Ca_3Fe_2(SiO_4)_3$
- Uvarovite - $Ca_3Cr_2(SiO_4)_3$
- Hydrogrossular - $Ca_3Al_2Si_2O_8(SiO_4)_{3-m}(OH)_{4m}$
- Chloritoid - $(Fe,Mg,Mn)_2Al_4Si_2O_{10}(OH)_4$
- Lawsonite - $CaAl_2(Si_2O_7)(OH)_2 \cdot H_2O$
- Epidote group (has both $(SiO_4)^{4-}$ and $(Si_2O_7)^{6-}$ groups)
- Epidote - $Ca_2(Al,Fe)_3O(SiO_4)(Si_2O_7)(OH)$
- Zoisite - $Ca_2Al_3O(SiO_4)(Si_2O_7)(OH)$
- Clinozoisite - $Ca_2Al_3O(SiO_4)(Si_2O_7)(OH)$
- Tanzanite - $Ca_2Al_3O(SiO_4)(Si_2O_7)(OH)$
- Allanite - $Ca(Ce,La,Y,Ca)Al_2(Fe_2+,Fe_3+)O(SiO_4)(Si_2O_7)(OH)$
- Dollaseite-(Ce) - $CaCeMg_2AlSi_3O_{11}F(OH)$
- Vesuvianite (idocrase) - $Ca_{10}(Mg,Fe)_2Al_4(SiO_4)_5(Si_2O_7)_2(OH)_4$
- 4-member ring
- Axinite - $(Ca,Fe,Mn)_3Al_2(BO_3)(Si_4O_{12})(OH)$
- 6-member ring
- Beryl/Emerald - $Be_3Al_2(Si_6O_{18})$
- Cordierite - $(Mg,Fe)_2Al_3(Si_5AlO_{18})$
- Tourmaline - $(Na,Ca)(Al,Li,Mg)_3$-$(Al,Fe,Mn)_6(Si_6O_{18})(BO_3)_3(OH)_4$
- Mica group
- Biotite - $K(Mg,Fe)_3(AlSi_3)O_{10}(OH)_2$
- Phlogopite - $KMg_3(AlSi_3)O_{10}(OH)_2$
- Margarite - $CaAl_2(Al_2Si_2)O_{10}(OH)_2$
- Glauconite - $(K,Na)(Al,Mg,Fe)_2(Si,Al)_4O_{10}(OH)_2$
- Chlorite group
- Chlorite - $(Mg,Fe)_3(Si,Al)_4O_{10}(OH)_2 \bullet (Mg,Fe)_3(OH)_6$
- Na-Ca feldspars
- Plagioclase feldspars
- Oligoclase - $(Na,Ca)(Si,Al)_4O_8$ (Na:Ca 4:1)

- Andesine - $(Na,Ca)(Si,Al)_4O_8$ (Na:Ca 3:2)
- Labradorite - $(Na,Ca)(Si,Al)_4O_8$ (Na:Ca 2:3)
- Bytownite - $(Na,Ca)(Si,Al)_4O_8$ (Na:Ca 1:4)
- Anorthite - $CaAl_2Si_2O_8$
- Feldspathoid family
- Cancrinite - $Na_6Ca_2(CO_3,Al_6Si_6O_{24}).2H_2O$
- Hauyne - $(Na,Ca)_4\text{-}8Al_6Si_6(O,S)24(SO_4,Cl)_{1\text{-}2}$
- Lazurite - $(Na,Ca)_8(AlSiO_4)_6(SO_4,S,Cl)_2$
- Scapolite group
- Meionite - $Ca_4(Al_2Si_2O_8)_3(Cl_2CO_3,SO_4)$
- Zeolite group
- Chabazite - $CaAl_2Si_4O_{12}\bullet 6H_2O$
- Heulandite - $CaAl_2Si_7O_{18}\bullet 6H_2O$
- Stilbite - $NaCa_2Al_5Si_{13}O_{36}\bullet 17H_2O$

References

Limiting references

This place does not cover:

Illite - $(K,H_3O)(Al,Mg,Fe)_2(Si,Al)_4O_{10}[(OH)_2,(H_2O)]$	C04B 2235/349
Montmorillonite - $(Na,Ca)_{0.33}(Al,Mg)_2Si_4O_{10}(OH)_2\cdot nH_2O$	C04B 2235/349
Vermiculite - $(MgFe,Al)_3(Al,Si)_4O_{10}(OH)_2\cdot 4H_2O$	C04B 2235/349

Informative references

Attention is drawn to the following places, which may be of interest for search:

Alkaline earth metal alumino-silicate based ceramics	C04B 35/195
Cordierite honeycombs	C04B 38/0006 and subgroups
Alkaline earth oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. BeO	C04B 2235/3205 and subgroups
Cordierite honeycombs containing a catalyst	B01J 35/04

Special rules of classification

If the alumino-silicate contains both alkali and alkaline earth metals, both C04B 2235/3472 and C04B 2235/3481 are given. The presence of other oxides in the silicate is indicated with symbols from C04B 2235/32 - C04B 2235/3409.

C04B 2235/349

Clays, e.g. bentonites, smectites such as montmorillonite, vermiculites or kaolines, e.g. illite, talc or sepiolite

Definition statement

This place covers:

Clay starting materials added to non-clay wares, thus to all ceramics that are classified in C04B 35/00 and sub-classes.

References

Limiting references

This place does not cover:

Clay starting materials used for making clay wares	C04B 33/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: clays	C04B 14/10 and subgroups
Inorganic binders based on silicon compounds	C04B 35/6316
Aluminates other than alumino-silicates as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. spinel (MgAl2O4)	C04B 2235/3222
Alumino-silicates other than clay as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. mullite (3Al2O3-2SiO2)	C04B 2235/3463
Clay used as filler for polymers	C08K 3/346

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Clay	Clays are distinguished from other fine-grained soils by differences in size and mineralogy. Silts, which are fine-grained soils that do not include clay minerals, tend to have larger particle sizes than clays, but there is some overlap in both particle size and other physical properties, and there are many naturally occurring deposits which include silts and also clay . The distinction between silt and clay varies by discipline. Geologists and soil scientists usually consider the separation to occur at a particle size of 2 µm (clays being finer than silts), sedimentologists often use 4-5 µm, and colloid chemists use 1 µm. Geotechnical engineers distinguish between silts and clays based on the plasticity properties of the soil, as measured by the soils' Atterberg Limits . ISO 14688 grades clay particles as being smaller than 2 µm and silts larger. Clay minerals are hydrous aluminium phyllosilicates, sometimes with variable amounts of iron, magnesium, alkali metals, alkaline earths, and other cations. Clays have structures similar to the micas and therefore form flat hexagonal sheets Clays are commonly referred to as 1:1 or 2:1. Clays are fundamentally built of tetrahedral sheets and octahedral sheets. A 1:1 clay would consist of one tetrahedral sheet and one octahedral sheet, and examples would be kaolinite and serpentine. A 2:1 clay consists of an octahedral sheet sandwiched between two tetrahedral sheets, and examples are illite, smectite, attapulgite, and chlorite (although chlorite has an external octahedral sheet often referred to as "brucite"). Clay minerals include the following groups:Kaolin group which includes the minerals kaolinite, dickite, halloysite, and nacrite (polymorphs of $Al_2Si_2O_5(OH)_4$). Some sources include the kaolinite-serpentine group due to structural similarities. Smectite group which includes dioctahedral smectites such as montmorillonite and nontronite and trioctahedral smectites for example saponite . Illite group which includes the clay-micas. Illite is the only common mineral. Chlorite group includes a wide variety of similar minerals with considerable chemical variation. Other 2:1 clay types exist such as sepiolite or attapulgite , clays with long water channels internal to their structure. Clay mineral group Halloysite - $Al_2Si_2O_5(OH)_4$ Kaolinite - $Al_2Si_2O_5(OH)_4$ Illite - $(K,H_3O)(Al,Mg,Fe)_2(Si,Al)_4O_{10}[(OH)_2,(H_2O)]$ Montmorillonite - $(Na,Ca)_{0.33}(Al,Mg)_2Si_4O_{10}(OH)_2 \cdot nH_2O$ Vermiculite - $(MgFe,Al)_3(Al,Si)_4O_{10}(OH)_2 \cdot 4H_2O$ Talc - $Mg_3Si_4O_{10}(OH)_2$ Palygorskite - $(Mg,Al)_2Si_4O_{10}(OH) \cdot 4(H_2O)$ Pyrophyllite - $Al_2Si_4O_{10}(OH)_2$

C04B 2235/36

Glass starting materials for making ceramics, e.g. silica glass

Definition statement

This place covers:

Glass powder used as starting material for making ceramics

Relationships with other classification places

Manufacture, shaping of glass C03B

Glass compositions C03C

References

Limiting references

This place does not cover:

Glass fibers used as additive for ceramics	C04B 35/82
Fused silica as starting material for making ceramics	C04B 2235/3418
Amorphous silica as starting material for making ceramics, e.g. silica fume	C04B 2235/3418
Waterglass (NaSiO3) starting material for making ceramics	C04B 2235/3427, C04B 2235/3201
Glass phase formed in situ during sintering	C04B 2235/85 (grain boundary phase)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: glass	C04B 14/22 and subgroups
Waste glass used for making ceramics	C04B 33/13
Melting of clay material to make clay wares	C04B 33/323
Melting of material to make a ceramic powder	C04B 35/62665
Inorganic binders based on silicon compounds	C04B 35/6316
Melting of ceramic or refractory material to make a bulk ceramic	C04B 35/653 and subgroups
Crystalline silica as starting material for making ceramics	C04B 2235/3418
Clays as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. bentonites/smectites such as montmorillonite, kaolines such as halloysite, illite, talc, sepiolite and attapulgite, vermiculite	C04B 2235/349
Products characterised by the absence or the low content of specific components, e.g. alkali metal free alumina ceramics	C04B 2235/72 and subgroups
Glass interlayer used for joining a ceramic with another substrate	C04B 2237/10

Special rules of classification

The composition of the glass is not further classified with symbols from the C04B 2235/32 scheme. The composition of the glass should be classified in C03C.

C04B 2235/365

Borosilicate glass

Definition statement

This place covers:

All glasses that contain both silicon oxide and boron oxide and are used as starting material for making glass.

References

Limiting references

This place does not cover:

Boron oxide, borates, boric acids, or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. boric acid (HBO2)	C04B 2235/3409

Informative references

Attention is drawn to the following places, which may be of interest for search:

Glass compositions containing less than 40 wt% silica and also boron	C03C 3/064 and subgroups
Glass compositions containing less than 40 wt% silica, containing lead and also boron	C03C 3/072 and subgroups
Glass compositions containing 40-90 wt% silica and also boron	C03C 3/089 and subgroups
Glass compositions containing 40-90 wt% silica, containing lead and also boron	C03C 3/108
Glass compositions containing 40-90 wt% silica, containing fluorine and also boron	C03C 3/115 and subgroups

C04B 2235/38

Non-oxide ceramic constituents or additives

Definition statement

This place covers:

All starting materials for making ceramics containing carbide, nitride, boride or silicide phase. All sintered ceramics containing a secondary carbide, nitride, boride or silicide phase.

References

Limiting references

This place does not cover:

The use of metal fibers as reinforcement for ceramics	C04B 35/76
Metallic constituents or additives not added as binding phase, or present as secondary phase in a sintered ceramic	C04B 2235/40 and subgroups

Non metallic elements added as constituents or additives, or present as secondary phase in a sintered ceramic, e.g. silicon, boron, carbon, sulphur, phosphor, selenium or tellurium	C04B 2235/42 and subgroups
The use of phosphides as starting material for making ceramics, or their presence as secondary phase in a sintered ceramic	C04B 2235/44
The use of halides such as fluorides as starting material for making ceramics, or their presence as secondary phase in a sintered ceramic	C04B 2235/444 and subgroups
The use of selenides, sulfides or tellurides as starting material for making ceramics, or their presence as secondary phase in a sintered ceramic	C04B 2235/446
Non-oxide fibers used as starting material for making ceramics	C04B 2235/524 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on non-oxide ceramics	C04B 35/515 and subgroups
Making fibres based on non-oxide ceramic material	C04B 35/62272
Coating or impregnating ceramic substrates with non-oxide ceramics	C04B 41/5053
Metal oxide starting materials for making ceramics or present as secondary phase in a sintered ceramic, e.g. alumina, ferrites, titanates, cuprates	C04B 2235/32 and subgroups
Non-metal oxide starting material or secondary phase, e.g. silica, silicates, boron oxide	C04B 2235/34 and subgroups
Metal oxide starting material or secondary phase present in a glass phase	C04B 2235/36 and subgroups
Metal salt constituents or additives chosen for the nature of the anions, e.g. hydrides or acetylacetonate	C04B 2235/44 and subgroups
Products characterised by the absence or the low content of specific components, e.g. alkali metal free alumina ceramics	C04B 2235/72 and subgroups
Non-oxide interlayer used for joining a ceramic with another substrate	C04B 2237/08 and subgroups
Non-oxide substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/36 and subgroups

Special rules of classification

If a certain starting material or secondary phase is a mixture of two or more metal non-oxides, e.g. CaMg boride, then both metal non-oxides are classified, also if one is present less than the other, e.g. Ca0.2Mg0.8B2, thus both C04B 2235/3808 (for the Mg) and C04B 2235/3804 (for the Ca) are given.

C04B 2235/3804

Borides

Definition statement

This place covers:

Starting materials for making ceramics or secondary phases of sintered ceramics containing a compound between boron and a metal or semi-metal, e.g. aluminium boride, Rare earth boride, e.g.

dysprosium boride (DyB_2), Lanthanum boride (LaB_6), Manganese boride (Mn_2B, MnB or MnB_2), Iron boride (Fe_2B, FeB), Cobalt boride (CoB), Nickel boride (NiB), Copper boride (Cu_3B_2), Gallium boride (GaB_{12}), Scandium Iridium Boride ($Sc_3Ir_5B_2$), Silver boride (AgB_2), Nickel bismuth boride ($Ni_{23-x}Bi_xB_6$), Silicon boride (SiBn)

References

Limiting references

This place does not cover:

Boron carbide additive or secondary phase	C04B 2235/3821
Boron nitride additive or secondary phase	C04B 2235/386
Boron additive or secondary phase	C04B 2235/421

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: borides	C04B 14/321
Ceramics based on borides	C04B 35/5805 and subgroups
Coating or impregnating ceramic substrates with borides	C04B 41/507
Boron oxide or borate starting material or secondary phase	C04B 2235/3409
Borosilicate glass additive	C04B 2235/365
Boron-containing organic compounds becoming part of a ceramic after heat treatment, e.g. borazine, borane or boranyl	C04B 2235/486
Preparation of metal boride powders	C01B 35/04
Non-ferrous alloys containing at least 5% by weight but less than 50% by weight of borides	C22C 32/0073 and subgroups
Making ferrous alloys by powder metallurgy with more than 5% preformed carbides, nitrides or borides	C22C 33/0292

C04B 2235/3808

Magnesium borides

Definition statement

This place covers:

Starting materials for making ceramics or secondary phases of sintered ceramics containing a compound between boron and magnesium, e.g. magnesium boride, MgB2

References

Limiting references

This place does not cover:

Magnesium boron carbide additive or secondary phase	C04B 2235/3821, C04B 2235/3817

Magnesium boron nitride additive or secondary phase	C04B 2235/386, C04B 2235/3852

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on magnesium boride	C04B 35/58057
Magnesium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3206
Magnesium starting material or secondary phase	C04B 2235/401

C04B 2235/3813

Refractory metal borides

Definition statement

This place covers:

Starting materials for making ceramics or secondary phases of sintered ceramics containing refractory metal borides or refractory metal oxy-borides, e.g. Titanium diboride (TiB_2), Vanadium diboride (VB_2), Chromium boride (CrB or CrB_2), Zirconium of hafnium diboride (ZrB_2 or HfB_2), Niobium or tantalum diboride (NbB_2 or TaB_2), Molybdenum boride (Mo_2B or Mo_2B_5), Tungsten boride (W_2B, WB or W_2B_5).

References

Limiting references

This place does not cover:

Refractory boron carbide additive or secondary phase	C04B 2235/3821, C04B 2235/3839 and subgroups
Refractory boron nitride additive or secondary phase	C04B 2235/386, C04B 2235/3886

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on refractory borides	C04B 35/5805 and subgroups
Refractory metal oxide starting material or secondary phase	C04B 2235/3231 and subgroups
Refractory metal carbide starting material or secondary phase	C04B 2235/3839 and subgroups
Refractory metal nitride starting material or secondary phase	C04B 2235/3886
Refractory metal silicide starting material or secondary phase	C04B 2235/3891
Refractory metal starting material or secondary phase	C04B 2235/404

C04B 2235/3817

Carbides

Definition statement

This place covers:

Starting materials for making ceramics or secondary phases of sintered ceramics containing a carbide phase, a compound between carbon and a metal or semi-metal, e.g. potassium carbide, magnesium carbide, Cerium carbide (CeC_2), Manganese carbide (Mn_3C), Iron carbide (Fe_3C), Cobalt carbide (CoC), Nickel carbide (Ni_3C), Copper carbide (Cu_2C), Zinc carbide (ZnC), Germanium carbide (GeC), Gold carbide (Au_2C_2), Silver carbide (Ag_2C_2), Antimony carbide (SbC)

References

Limiting references

This place does not cover:

Carbo-nitride starting material or secondary phase	C04B 2235/3856
Carbon as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/422 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: carbides	C04B 14/322
Ceramics based on carbides	C04B 35/56 and subgroups
Carbo-nitride ceramics	C04B 35/58 and subgroups
Making fibres based on carbides	C04B 35/62277
Coating or impregnating ceramic substrates with carbides	C04B 41/5057
Organic compounds becoming part of a ceramic after heat treatment, e.g. carbonising phenol resins	C04B 2235/48 and subgroups
Carbide interlayer used for joining a ceramic with another substrate	C04B 2237/083
Carbide catalysts	B01J 27/22, B01J 27/22, C07C 2527/22 and subgroups
High pressure synthesis: Composition of the material to be processed: carbides	B01J 2203/063 and subgroups
Making carbide powders	C01B 31/30 and subgroups
Carbides used as filler for polymers	C08K 3/14, C08K 3/14
Making hard metals based on borides, carbides, nitrides, oxides or silicides; Preparation of the powder mixture used as the starting material	C22C 1/051 and subgroups
Non-ferrous alloys containing at least 5% by weight but less than 50% by weight of carbides	C22C 32/0052 and subgroups

Making ferrous alloys by powder metallurgy with more than 5% preformed carbides, nitrides or borides	C22C 33/0292

Special rules of classification

Carbonitrides are seen as nitrides. If a ceramic is however a mixture of separate carbide and nitride phases, then classification occurs in the class that corresponds to the phase that is present as the largest fraction, which could be a carbide class.

Ti0.9Al0.1C and Ti0.1Al0.9C both receive both symbols C04B 2235/3817 and C04B 2235/3843.

C04B 2235/3821

Boron carbides

Definition statement

This place covers:

Boron carbides (B4C) or boron oxy-carbides as starting materials for making ceramics or as secondary phases of sintered ceramics.

References

Limiting references

This place does not cover:

Boron carbo-nitride starting material or secondary phase	C04B 2235/3856, C04B 2235/386

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: boron carbide	C04B 14/323
Ceramics based on boron carbide	C04B 35/563
Ceramics based on boron carbo-nitride	C04B 35/583 and subgroups
Coating or impregnating ceramic substrates with boron carbide	C04B 41/5058
Boron oxide, borates, boric acids, or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. boric acid (HBO2)	C04B 2235/3409
Borosilicate glass additive	C04B 2235/365
Borides as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3804 and subgroups
Boron nitride starting material for making ceramics or secondary phase of a sintered ceramic	C04B 2235/386
Boron as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/421
Boron-containing organic compounds becoming part of a ceramic after heat treatment, e.g. borazine, borane or boranyl	C04B 2235/486

The preparation of boron or silicon carbide powders	C01B 31/36
Non-ferrous alloys containing at least 5% by weight but less than 50% by weight of B4C	C22C 32/0057

Special rules of classification

In the case of mixed carbides, e.g. SiBC or Si0.9B1.1C, both C04B 2235/3826 and C04B 2235/3821 are added.

C04B 2235/3826

Silicon carbides

Definition statement

This place covers:

Silicon carbides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. SiC or SiOC

References

Limiting references

This place does not cover:

Silicon carbo-nitride starting material or secondary phase	C04B 2235/3856, C04B 2235/3873 and subgroups
Silicon carbide fibers used as starting material for making ceramics	C04B 2235/5244

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: silicon carbide	C04B 14/324
Ceramics based on titanium silicon (oxy)carbide	C04B 35/5615
Silicon carbide based ceramics	C04B 35/565 and subgroups
Ceramics based on silicon carbo-nitride	C04B 35/584 and subgroups
Making fibres based on silicon carbide	C04B 35/62281
Inorganic binders based on silicon compounds	C04B 35/6316
Coating or impregnating ceramic substrates with silicon carbide	C04B 41/5059
Silica as starting material for making a ceramic or as secondary phase of a sintered ceramic	C04B 2235/3418
Silicon nitrides as starting material for making a ceramic or as secondary phase of a sintered ceramic	C04B 2235/3873 and subgroups
Silicides as starting material for making a ceramic or as secondary phase of a sintered ceramic	C04B 2235/3891

Silicon as starting material for making a ceramic or as secondary phase of a sintered ceramic	C04B 2235/428
Si-containing organic compounds becoming part of a ceramic after heat treatment, e.g. silicone resins, (poly)silanes, (poly)siloxanes or (poly)silazanes	C04B 2235/483
Silicon carbide substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/365
Silicon carbide catalyst	B01J 27/224, B01J 27/224 and subgroups, C07C 2527/224
High pressure synthesis: Composition of the material to be processed: silicon carbide	B01J 2203/0635
The preparation of boron or silicon carbide powders	C01B 31/36
Non-ferrous alloys containing at least 5% by weight but less than 50% by weight of SiC	C22C 32/0063

Special rules of classification

Ti0.9Si0.1C and Ti0.1Si0.9C both receive both symbols C04B 2235/3843 and C04B 2235/3826.

C04B 2235/383

Alpha silicon carbide

Definition statement

This place covers:

Alpha silicon carbide as starting material for making ceramics or as secondary phase of a sintered ceramic

References

Limiting references

This place does not cover:

The main phase of the sintered ceramic being alpha SiC	C04B 2235/767

Informative references

Attention is drawn to the following places, which may be of interest for search:

Alpha silicon nitride as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3878
Hexagonal symmetry, alpha SiC	C04B 2235/767

C04B 2235/3834

Beta silicon carbide

Definition statement

This place covers:

Beta silicon carbide as starting material for making ceramics or as secondary phase of a sintered ceramic

References

Limiting references

This place does not cover:

The main phase of the sintered ceramic being beta SiC	C04B 2235/762

Informative references

Attention is drawn to the following places, which may be of interest for search:

Beta silicon nitride as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3882
Cubic symmetry, e.g. beta SiC	C04B 2235/762

C04B 2235/3839

Refractory metal carbides

Definition statement

This place covers:

Refractory metal carbides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. VC, Cr_3C_2, ZrC, HfC, NbC, TaC, MoC or Mo_2C

References

Limiting references

This place does not cover:

Refractory carbo-nitride starting material or secondary phase	C04B 2235/3856, C04B 2235/3886

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on refractory metal carbides	C04B 35/56
Refractory metal oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3231 and subgroups
Refractory metal borides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. TiB_2, HfB_2	C04B 2235/3813
Refractory metal nitrides as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3886

Refractory metal silicides as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3891
Refractory metals as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/404
The preparation of tungsten or molybdenum carbide powders	C01B 31/34

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

refractory carbides	titanium carbide, vanadium carbide, chromium carbide, zirconium carbide, niobium carbide, molybdenum carbide, hafnium carbide, tantalum carbide, tungsten carbide

C04B 2235/3843

Titanium carbides

Definition statement

This place covers:

Titanium carbide as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. TiC or titanium oxy-carbides

References

Limiting references

This place does not cover:

Titanium carbo-nitride starting material or secondary phase	C04B 2235/3856, C04B 2235/3886

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on titanium (oxy)carbide	C04B 35/5611 and subgroups
Titanium (oxy)carbonitride ceramics	C04B 35/58021
After-treatment of mortars, concrete, artificial stone or ceramics; Treatment of natural stone: with titanium carbide	C04B 41/5061
Titanium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. rutile or anatase	C04B 2235/3232 and subgroups
Making titanium (oxy)carbide powders	C01B 31/305

Special rules of classification

In the case of mixed refractory carbides, e.g. TiCrC, but also Ti0.9Cr1.1C both C04B 2235/3839 (for the Cr) and C04B 2235/3843 are added. Ti0.9Al0.1C and Ti0.1Al0.9C both receive both symbols C04B 2235/3817 and C04B 2235/3843.

C04B 2235/3847

Tungsten carbides

Definition statement

This place covers:

Tungsten carbides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. WC or tungsten oxy-carbides

References

Limiting references

This place does not cover:

Tungsten carbo-nitride starting material or secondary phase	C04B 2235/3856, C04B 2235/3886

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on tungsten (oxy)carbide	C04B 35/5626
Tungsten (oxy)carbonitride ceramics	C04B 35/58007
Tungsten oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. scheelite (CaWO4)	C04B 2235/3258 and subgroups
The preparation of tungsten or molybdenum carbide powders	C01B 31/34

C04B 2235/3852

Nitrides, e.g. oxynitrides, carbonitrides, oxycarbonitrides, lithium nitride, magnesium nitride

Definition statement

This place covers:

Starting materials for making ceramics or secondary phases of sintered ceramics containing compounds between nitrogen and a metal or semi-metal, e.g. alkali nitrides, alkaline earth metal nitrides, rare earth nitrides, carbonitrides, oxynitrides, Copper nitride (Cu_3N), Mercury nitride (Hg_3N_2), zinc nitride (Zn_3N_2) , Gallium indium nitride ($Ga_{1-x}In_xN$), Germanium nitride (Ge_3N_4), Ruthenium nitride (RuN), Silver nitride (AgN_3), Tin nitride (SnN), Antimony nitride (SbN), Lead nitride ($Pb(N_3)_2$), Bismuth nitride (BiN)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: nitrides	C04B 14/325

Ceramics based on nitrides	C04B 35/58 and subgroups
Making fibres based on nitrides	C04B 35/62286
Coating or impregnating ceramic substrates with borides, nitrides or silicides	C04B 41/5062
Gases other than oxygen used as reactant for making a ceramic phase, e.g. nitrogen used to make a nitride phase	C04B 2235/46 and subgroups
The preparation of nitride powders per se, not preparative to the making of nitride ceramics	C01B 21/06, C01B 21/06 and subgroups, C01B 21/082 and s subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing nitrides	C09K 11/0883, C09K 11/7492
Non-ferrous alloys containing at least 5% by weight but less than 50% by weight of nitrides	C22C 32/0068 and subgroups
Making ferrous alloys by powder metallurgy with more than 5% preformed carbides, nitrides or borides	C22C 33/0292

Special rules of classification

Carbonitrides and oxynitrides are seen as nitrides

C04B 2235/3856

Carbonitrides, e.g. titanium carbonitride, zirconium carbonitride

Definition statement

This place covers:

Carbonitrides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. titanium carbonitride, zirconium carbonitride

References

Limiting references

This place does not cover:

Making carbonitrides per se, not preparative to the making of a ceramic	C01B 21/0828

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based titanium (oxy)carbo-nitrides	C04B 35/58021
Ceramics based zirconium (oxy)carbo-nitrides	C04B 35/58035
Organic compounds becoming part of a ceramic after heat treatment, e.g. carbonising phenol resins	C04B 2235/48 and subgroups

Special rules of classification

Phases that receive the C04B 2235/3856 symbol also receive other symbols from C04B 2235/3852 and the subgroups to indicate the metal, e.g. aluminum carbo-nitride receives both C04B 2235/3856

and C04B 2235/3865. If the metal nitride is classified with the main C04B 2235/3852 symbol, then only C04B 2235/3856 needs to be given. Alkali or alkaline earth carbo-nitrides receives only the C04B 2235/3856 symbol.

C04B 2235/386

Boron nitrides

Definition statement

This place covers:

Boron nitrides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. boron oxynitrides or boron carbonitrides, cubic boron nitride, hexagonal boron nitride

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: boron nitride	C04B 14/327
Ceramics based on boron nitride	C04B 35/583 and subgroups
Making fibres based on boron nitride	C04B 35/6229
Coating or impregnating ceramic substrates with boron nitride	C04B 41/5064
Boron oxide, borates, boric acids, or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. boric acid (HBO_2)	C04B 2235/3409
Borosilicate glass additive	C04B 2235/365
Borides as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3804 and subgroups
Boron carbide starting material for making ceramics or secondary phase of a sintered ceramic	C04B 2235/3821
Boron as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/421
Boron-containing organic compounds becoming part of a ceramic after heat treatment, e.g. borazine, borane or boranyl	C04B 2235/486
Boron nitride substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/361
High pressure synthesis: Composition of the material to be processed: boronitrides	B01J 2203/0645
The preparation of boron nitride powders per se, not preparative to the making of nitride ceramics	C01B 21/064, C01B 21/064 and subgroups

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

hBN	Hexagonal boron nitride

cBN	Cubic boron nitride

C04B 2235/3865

Aluminium nitrides

Definition statement

This place covers:

Aluminum nitrides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. aluminium carbonitrides

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: aluminium nitride	C04B 14/326
Ceramics based on aluminum nitride	C04B 35/581
Coating or impregnating ceramic substrates with aluminium nitride	C04B 41/5063
Aluminium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. bauxite, alpha-alumina	C04B 2235/3217 and subgroups
Aluminium as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/402
Aluminum nitride substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/366
The preparation of aluminium nitride powders per se, not preparative to the making of nitride ceramics	C01B 21/072, C01B 21/072 and subgroups, C01B 21/0825 (oxy-nitrides)

C04B 2235/3869

Aluminium oxynitrides, e.g. AlON, sialon

Definition statement

This place covers:

Starting materials or secondary phases based on oxynitrides containing at least aluminium (AlON) or also silicon (Sialon), possibly further containing rare earths

References

Limiting references

This place does not cover:

SiON starting material or secondary phase	C04B 2235/3873

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on AlON	C04B 35/581
Ceramics based on SiAlON	C04B 35/597
Coating or impregnating ceramic substrates with silicon oxynitrides, e.g. SIALON	C04B 41/5067
Silicon nitrides as starting material for making a ceramic or as secondary phase of a sintered ceramic	C04B 2235/3873 and subgroups
Non-oxides with a defined oxygen content as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3895
Making aluminium oxynitrides powders per se	C01B 21/0825
The preparation of sialon powders per se, not preparative to the making of nitride ceramics	C01B 21/0826

C04B 2235/3873

Silicon nitrides, e.g. silicon carbonitride, silicon oxynitride

Definition statement

This place covers:

Silicon nitrides as starting material for making a ceramic or as secondary phase of a sintered ceramic, e.g. Si_3N_4, silicon carbonitride or silicon oxynitride (SiON)

References

Limiting references

This place does not cover:

Silicon aluminium oxy-nitride (Sialon) additives or secondary phases	C04B 2235/3869

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: silicon nitride	C04B 14/328
Ceramics based on silicon (carbo)nitrides	C04B 35/484 and subgroups
Ceramics based on silicon oxy-nitrides	C04B 35/597
Making fibres based on silicon nitrides	C04B 35/62295
Inorganic binders based on silicon compounds	C04B 35/6316
Coating or impregnating ceramic substrates with silicon nitride	C04B 41/5066
Silica as starting material for making a ceramic or as secondary phase of a sintered ceramic	C04B 2235/3418
Silicon carbides as starting material for making a ceramic or as secondary phase of a sintered ceramic	C04B 2235/3826 and subgroups

Silicides as starting material for making a ceramic or as secondary phase of a sintered ceramic	C04B 2235/3891
Silicon as starting material for making a ceramic or as secondary phase of a sintered ceramic	C04B 2235/428
Si-containing organic compounds becoming part of a ceramic after heat treatment, e.g. silicone resins, (poly)silanes, (poly)siloxanes or (poly)silazanes	C04B 2235/483
Silicon nitride substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/368
The preparation of silicon nitride powders per se, not preparative to the making of nitride ceramics	C01B 21/068, C01B 21/068 and subgroups, C01B 21/0823 (oxy-nitrides)

Special rules of classification

Mixed nitrides, e.g. SiBN or $Si_{0.9}B_{1.1}N$ receive symbols for both nitrides, thus C04B 2235/3873 and C04B 2235/386.

C04B 2235/3878

Alpha silicon nitrides

Definition statement

This place covers:

Alpha silicon nitride as starting material for making ceramics or as secondary phase of a sintered ceramic

References

Limiting references

This place does not cover:

The main phase of the sintered ceramic being alpha Si_3N_4	C04B 2235/766

Informative references

Attention is drawn to the following places, which may be of interest for search:

Alpha silicon carbide as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/383
Trigonal symmetry, alpha Si_3N_4	C04B 2235/766

C04B 2235/3882

Beta silicon nitrides

Definition statement

This place covers:

Beta silicon nitride as starting material for making ceramics or as secondary phase of a sintered ceramic

References

Limiting references

This place does not cover:

The main phase of the sintered ceramic being beta Si_3N_4	C04B 2235/767

Informative references

Attention is drawn to the following places, which may be of interest for search:

Beta silicon carbide as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3834
He_xagonal symmetry, beta Si_3N_4	C04B 2235/767

C04B 2235/3886

Refractory metal nitrides, e.g. vanadium nitride, tungsten nitride

Definition statement

This place covers:

Refractory metal nitrides as starting material for making ceramics or as secondary phase of a sintered ceramic, or refractory metal oxynitrides, e.g. Titanium nitride (TiN), Vanadium nitride (VN), Chromium nitride (CrN), Zirconium of hafnium nitride (ZrN or HfN), Niobium or tantalum nitride (NbN or TaN), Molybdenum nitride (MoN), Tungsten nitride (W_2N or WN_2)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on refractory metal (oxy)(carbo)nitrides	C04B 35/58014 and subgroups
Coating or impregnating ceramic substrates with titanium nitride	C04B 41/5068
Refractory metal oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3231 and subgroups
Refractory metal borides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. TiB2, HfB2	C04B 2235/3813
Refractory metal carbides as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3839
Refractory metal silicides as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3891
Refractory metals as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/404
The preparation of nitride powders per se, not preparative to the making of nitride ceramics, with vanadium, niobium or tantalum	C01B 21/0617, C01B 21/0617
The preparation of nitride powders per se, not preparative to the making of nitride ceramics, with chromium, molybdenum or tungsten	C01B 21/062, C01B 21/062
The preparation of titanium, zirconium or hafnium nitride powders per se, not preparative to the making of nitride ceramics	C01B 21/076 and subgroups, C01B 21/076

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

refractory nitrides	titanium nitride, vanadium nitride, chromium nitride, zirconium nitride, niobium nitride, molybdenum nitride, hafnium nitride, tantalum nitride, tungsten nitride

C04B 2235/3891

Silicides, e.g. molybdenum disilicide, iron silicide

Definition statement

This place covers:

Silicides as starting material for making a ceramic or as secondary phase of a sintered ceramic, i.e. chemical compounds between silicon and a one or more metals, e.g. Titanium disilicide ($TiSi_2$), Vanadium disilicide (VSi_2), Chromium silicide ($CrSi_2$), Zirconium of hafnium disilicide ($ZrSi_2$ or $HfSi_2$), Niobium or tantalum disilicide ($NbSi_2$ or $TaSi_2$), Molybdenum disilicide ($MoSi_2$), Tungsten silicide (WSi_2), Manganese silicide ($MnSi_2$), Iron silicide (FeSi, $FeSi_2$), Cobalt silicide (Co_2Si, CoSi, $CoSi_2$), Nickel silicide (Ni_2Si), Copper silicide (Cu_4Si), Gallium silicide (Ga_3Si), germanium silicide ($Si_{1-x}Ge_x$), Osmium silicide (Os_2Si_3)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on silicides	C04B 35/58085 and subgroups
Inorganic binders based on silicon compounds	C04B 35/6316
Coating or impregnating ceramic substrates with silicides	C04B 41/5071
Metal as starting material for making ceramics or as secondary phase of a sintered ceramic, not being present as a binding phase	C04B 2235/40 and subgroups
Silicon as starting material for making a ceramic or as secondary phase of a sintered ceramic	C04B 2235/428
The preparation of metal silicide powders	C01B 33/06
Non-ferrous alloys containing at least 5% by weight but less than 50% by weight of silicides	C22C 32/0078 and subgroups

C04B 2235/3895

Non-oxides with a defined oxygen content, e.g. SiOC, TiON

Definition statement

This place covers:

Non-oxides with a defined oxygen content as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. SiOC, SiON, TiON. The amount of oxygen of a certain non-oxide starting material is indicated, e.g. a boride powder containing 0.1 wt% oxygen, or a silicide containing 5 wt% oxygen.

References

Limiting references

This place does not cover:

Aluminum oxynitrides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. AlON or sialon	C04B 2235/3869

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on carbides having a well-defined oxygen content, e.g. oxy-carbides	C04B 35/5603
Products characterised by the absence or the low content of oxygen	C04B 2235/723
The preparation of oxynitride powders per se, not preparative to the making of nitride ceramics	C01B 21/0821
Making powders of oxycarbides, sulfocarbides or mixtures of carbides with other bodies, e.g. graphite; Carbides of other non-metals, e.g. silicocarbides, borocarbides	C01B 31/301

Special rules of classification

A material that receive this symbol can also receive other non-oxide symbols, e.g. SiON starting powder or secondary phase receives both symbols C04B 2235/3895 and C04B 2235/3873.

C04B 2235/40

Metallic constituents or additives not added as binding phase

Definition statement

This place covers:

Metal as starting material for making ceramics or as secondary phase of a sintered ceramic, not being present as a binding phase, e.g. La, Y, Mn, Re, Zn, Ga, In, Ge, Sb, Pb, Bi. The metal can be added for instance in powder form, in gaseous form or in a molten state.

References

Limiting references

This place does not cover:

Non metallic elements as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. sulphur, phosphor, carbon, boron, silicon, selenium or tellurium	C04B 2235/42 and subgroups
Products characterised by the absence or the low content of metal phase	C04B 2235/725
Ceramics containing a metallic binder, i.e. cermets	C22C 29/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: metallic additives	C04B 14/34
Ceramics based on non-oxide ceramics	C04B 35/515 and subgroups
Reaction sintering of free metal or free silicon containing compositions to make a ceramic material	C04B 35/65 and subgroups
Metal oxides, mixed metal oxides or oxide forming salts thereof, e.g. carbonates, nitrates, (oxy)hydroxides, chlorides, as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/32 and subgroups
Metal interlayer used for joining a ceramic with another substrate	C04B 2237/12 and subgroups
Metallic powders per se	B22F 1/0003 and subgroups
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: metallic pigments or fillers	C09C 1/62, C09C 1/62 and subgroups

Special rules of classification

If the end product contains a continuous metal phase, the product is regarded as a cermet and is classified in C22C 29/00 and sub subgroups. In this case neither the end product is classified in C04B 35/00 and sub-classes, nor are the starting materials classified in C04B 2235/00 and subgroups.

C04B 2235/401

Alkaline earth metals

Definition statement

This place covers:

Alkaline earth metals as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. Mg

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on magnesium boride	C04B 35/58057
Alkaline earth oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. BeO	C04B 2235/3205 and subgroups
Magnesium borides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. MgB2	C04B 2235/3808

C04B 2235/402

Aluminium

Definition statement

This place covers:

Aluminium as starting material for making ceramics or as secondary phase of a sintered ceramic

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Alumina based ceramics	C04B 35/10 and subgroups
Ceramics based on aluminum nitride	C04B 35/581
Aluminium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. bauxite, alpha-alumina	C04B 2235/3217 and subgroups
Aluminum nitrides as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3865
Aluminium interlayer used for joining a ceramic with another substrate	C04B 2237/121

C04B 2235/404

Refractory metals

Definition statement

This place covers:

Refractory metals as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. titanium (Ti), chromium (Cr), tantalum (Ta)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Refractory metal carbide ceramics	C04B 35/5607 and subgroups
Refractory metal nitride ceramics	C04B 35/58007 and subgroups
Refractory metal boride ceramics	C04B 35/58064 and subgroups
Refractory metal silicide ceramics	C04B 35/58092 and subgroups
Titanium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. rutile or anatase	C04B 2235/3232 and subgroups
Refractory metal borides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. TiB_2, HfB_2	C04B 2235/3813

Refractory metal carbides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. VC, Cr_3C_2, ZrC, HfC, NbC, TaC, MoC or Mo_2C	C04B 2235/3839 and subgroups
Refractory metal nitrides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. vanadium nitride (VN), tungsten nitride (WN_2)	C04B 2235/3886
Refractory metal interlayer used for joining a ceramic with another substrate	C04B 2237/122
Metallic interlayer used for joining a ceramic with another substrate, containing a refractory metal as the active component	C04B 2237/127

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

refractory metals	titanium, vanadium, chromium, zirconium, niobium, molybdenum, hafnium, tantalum, tungsten

C04B 2235/405

Iron group metals

Definition statement

This place covers:

Iron group metals as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. nickel (Ni) or cobalt (Co)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Iron group nitride based ceramics	C04B 35/58042
Iron group oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/327 and subgroups
Iron group metal interlayer used for joining a ceramic with another substrate	C04B 2237/123

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

iron group metals	Fe, Ni, Co

C04B 2235/407

Copper

Definition statement

This place covers:

Copper as starting material for making ceramics or as secondary phase of a sintered ceramic

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Copper oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. CuO or Cu_2O	C04B 2235/3281 and subgroups
Copper interlayer used for joining a ceramic with another substrate	C04B 2237/124

C04B 2235/408

Noble metals

Definition statement

This place covers:

Noble metals as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. silver (Ag), palladium (Pd), platinum (Pt)

References

Limiting references

This place does not cover:

Noble metal oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. IrO2, PdO, RhO2	C04B 2235/3289 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Noble metal interlayer used for joining a ceramic with another substrate	C04B 2237/125

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

noble metals	Ru, Rh, Pd, Ag, Os, Ir, Pt, Au

C04B 2235/42

Non metallic elements added as constituents or additives, e.g. sulfur, phosphor, selenium or tellurium

Definition statement

This place covers:

Non metallic elements as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. sulphur, phosphor, selenium or tellurium, arsenium. The elements should be in their elemental state, thus not present in any compound. The end-product is allowed to have a continuous phase of the non-metallic element, it is still regarded as a ceramic.

References

Limiting references

This place does not cover:

Metal salts chosen for the nature of the anions as starting material for making ceramics, e.g. phosphides, arsenides	C04B 2235/44
Sulphides, tellurides or selenides as starting material for making ceramics	C04B 2235/446

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on phosphates	C04B 35/447
Ceramics based on phosphides	C04B 35/5154
Ceramics based on sulphides, selenides or tellurides	C04B 35/547
Phosphates or phosphites (calcium phosphates C04B 2235/3212) as starting material for making ceramics, e.g. orthophosphate (PO_4^{3-}), pyrophosphate ($P_2O_7^{4-}$), hypophosphite ($H_2PO_2^-$)	C04B 2235/447
Sulphates (SO_4^{2-}) or sulphites (SO_3^-)as starting material for making ceramics	C04B 2235/448
Products characterised by the absence or the low content of specific components, e.g. alkali metal free alumina ceramics	C04B 2235/72 and subgroups

C04B 2235/421

Boron

Definition statement

This place covers:

Boron as starting material for making ceramics or as secondary phase of a sintered ceramic. The boron is in its elemental state (B).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Boron oxide, borates, boric acids, or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. boric acid (HBO2)	C04B 2235/3409
Borides as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3804 and subgroups
Boron carbide as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. B4C	C04B 2235/3821
Boron nitrides as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/386
Preparation of boron	C01B 35/023

C04B 2235/422

Carbon

Definition statement

This place covers:

All starting materials for making ceramics containing an inorganic carbon phase; all secondary phases of sintered ceramics consisting out of carbon

References

Limiting references

This place does not cover:

Ceramics based on oxide ceramics, containing carbon	C04B 35/013
Refractory ceramics based on alumina, containing carbon	C04B 35/103
Adding carbonaceous materials, e.g. coal, carbon, graphite, hydrocarbons and burning-out the carbonaceous material in order to create a porous ceramic	C04B 38/068

Informative references

Attention is drawn to the following places, which may be of interest for search:

Carbon used as filler for concrete, mortar or artificial stone	C04B 14/022 and subgroups
Ceramics based on carbon	C04B 35/52 and subgroups
Ceramics or ceramic mixtures based on carbides	C04B 35/56 and subgroups
Reaction sintering C to make SiC	C04B 35/573
Reaction sintering C to make Si_3N_4	C04B 35/591
A carbon-based matrix containing carbon fibers	C04B 35/83

Coating or impregnating a ceramic substrates with carbon	C04B 41/5001 and subgroups
Carbides as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3817 and subgroups
Carbonitrides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. titanium carbonitride, zirconium carbonitride	C04B 2235/3856
Organics compounds becoming part of a ceramic after heat-treatment, e.g. phenol resins	C04B 2235/48 and subgroups
fibrous carbon additives for ceramics	C04B 2235/5248
carbon nanotube additives for ceramics	C04B 2235/5288
Ceramics or ceramic mixtures containing carbon as an impurity	C04B 2235/721
Carbon interlayer used for joining a ceramic with another substrate	C04B 2237/086
Carbon substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/363
Catalysts comprising carbon	B01J 21/18, B01J 21/18, and subgroups, C07C 2521/18
High pressure synthesis: Composition of the material to be processed: carbon	B01J 2203/0625
The preparation of carbon powders per se, not preparative to the making of carbon ceramics	C01B 31/00 and subgroups
preparation of active carbon using carbonaceous precursors per se and binders, e.g. pitch, and producing the granules	C01B 31/14
Carbon used as filler for polymers	C08K 3/04
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: carbon	C09C 1/44, C09C 1/44 and subgroups

Special rules of classification

If the carbon additive for the oxide ceramic is plain carbon, C04B 35/013 is given and C04B 2235/422 not, but if the carbon is carbon black, graphite or diamond, C04B 35/013 is given together with the respective symbol of C04B 2235/422. Same accounts for C04B 35/103.

C04B 2235/424

Carbon black

Definition statement

This place covers:

Carbon black as starting material for making ceramics or as secondary phase of a sintered ceramic

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: carbon black	C09C 1/48, C09C 1/48 and subgroups

C04B 2235/425

Graphite

Definition statement

This place covers:

Graphite as starting material for making ceramics or as secondary phase of a sintered ceramic

References

Limiting references

This place does not cover:

Graphite added to a ceramic to be burned away, e.g. to create porosity (pore former)	C04B 38/068

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of graphite as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of graphite specially adapted to enhance their filling properties in mortars, concrete or artificial stone	C04B 14/024
Ceramics based on graphite	C04B 35/522
Ceramics based on expanded graphite	C04B 35/536
High pressure synthesis: Composition of the material to be processed: graphite	B01J 2203/061
The preparation and after-treatment of intercalated graphite powders	C01B 31/005, C01B 31/0415
The preparation and after-treatment of graphite powders	C01B 31/04 and subgroups
Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties: graphite	C09C 1/46, C09C 1/46
Intercalated carbon- or graphite fibres	D01F 11/129

C04B 2235/427

Diamond

Definition statement

This place covers:

Diamond as starting material for making ceramics or as secondary phase of a sintered ceramic

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Presses for the formation of diamonds or boronitride	B01J 3/065 and subgroups

High pressure synthesis: Composition of the material to be processed: diamond	B01J 2203/062
The preparation and after-treatment of diamond powders	C01B 31/06 and subgroups

C04B 2235/428

Silicon

Definition statement

This place covers:

Silicon as starting material for making a ceramic or as secondary phase of a sintered ceramic. The end product can contain silicon up to 50% in order to be still regarded as a ceramic product.

References

Limiting references

This place does not cover:

Silicon present in the end product in an amount of more than 50%	H01, H05 (the field of use of the material)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Reaction sintering Si to make SiC ceramic	C04B 35/573
Reaction sintering Si to make Si_3N_4 ceramic	C04B 35/591
Inorganic binders based on silicon compounds	C04B 35/6316
Reaction sintering of free metal or free silicon containing compositions to make a ceramic material	C04B 35/65 and subgroups
Silicon oxide, silicic acids, or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. silica sol, fused silica, silica fume, cristobalite, quartz or flint (glass constituents C04B 2235/36), e.g. silicic acid $H_2Si_2O_5$	C04B 2235/3418
Silicon carbides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. SiC or SiOC	C04B 2235/3826 and subgroups
Aluminum oxynitrides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. AlON or sialon	C04B 2235/3869
Silicon nitrides as starting material for making a ceramic or as secondary phase of a sintered ceramic, e.g. Si_3N_4, silicon carbonitride or silicon oxynitride (SiON)	C04B 2235/3873 and subgroups
Silicides as starting material for making a ceramic or as secondary phase of a sintered ceramic, i.e. chemical compounds between silicon and a one or more metals, e.g. chromium silicide ($CrSi_2$), molybdenum disilicide ($MoSi_2$), iron silicide (FeSi, $FeSi_2$), cobalt silicide (Co_2Si, CoSi, $CoSi_2$)	C04B 2235/3891
Products characterised by the absence or the low content of silicon	C04B 2235/728
Ceramic interlayer used for joining a ceramic with another substrate, containing silicon as the active component	C04B 2237/095

Metallic interlayer used for joining a ceramic with another substrate, containing silicon as the active component	C04B 2237/128
Silicon interlayer used for joining a ceramic with another substrate	C04B 2237/16

C04B 2235/44

Metal salt constituents or additives chosen for the nature of the anions, e.g. hydrides or acetylacetonate

Definition statement

This place covers:

Metal salts chosen for the nature of the anions as starting material for making ceramics, e.g. phosphides, hydrides, acetylacetonate, hydroxides, arsenides, or present as secondary phase in the sintered ceramic. In many cases the anion cannot be present in a sintered ceramic, for instance if it is organic, since it will burn away. In other cases the anion can be present, for instance phosphate, sometimes sulphate or halides, after sintering.

References

Limiting references

This place does not cover:

Aluminium hydroxide as starting material for making ceramics	C04B 2235/3218

Informative references

Attention is drawn to the following places, which may be of interest for search:

Organic additives for clay mixtures	C04B 33/1305
Ceramics based on phosphides	C04B 35/5154
Coating or impregnating ceramic substrates with salts or salty compositions	C04B 41/5007 and subgroups
Hydrides per se	C01B 6/00 and subgroups

Special rules of classification

Before the introduction of the C04B 2235/00-scheme the use of metal-organic salts as additive or constituent was classified in C04B 35/6325. Normally in the case a symbol from C04B 2235/44 is given for a certain starting material, no CPC-symbol from C04B 35/63-C04B 35/638 will be given.

C04B 2235/441

Alkoxides, e.g. methoxide, tert-butoxide

Definition statement

This place covers:

Alkoxides as starting material for making ceramics, e.g. methoxide, tert-butoxide, isopropoxide

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Organo metallic additives for making ceramics	C04B 35/6325

Special rules of classification

If C04B 2235/441 is used, C04B 35/6325 does not need to be used.

C04B 2235/442

Carbonates

Definition statement

This place covers:

Carbonates (CO32-) as starting material for making ceramics or present as secondary phase in the sintered ceramic

References

Limiting references

This place does not cover:

Dolomite, i.e. mixed calcium magnesium carbonate, or oxides derived from dolomite as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/321

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: carbonates	C04B 14/26 and subgroups
Coating or impregnating ceramic substrates with salts or salty compositions: containing carbon in the anion, e.g. carbonates	C04B 41/501
Methods for the preparation of carbonates or bicarbonates in general	C01B 31/24
Carbonates of sodium, potassium or alkali metals in general	C01D 7/00 and subgroups
Lithium carbonates, bicarbonates	C01D 15/08

C04B 2235/443

Nitrates or nitrites

Definition statement

This place covers:

Nitrates (NO3-) or nitrites (NO2-) as starting material for making ceramics

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating ceramic substrates with salts or salty compositions: containing nitrogen in the anion, e.g. nitrites	C04B 41/5009
Nitrates of sodium, potassium or alkali metals in general	C01D 9/00 and subgroups
Lithium nitrates	C01D 15/10
Preparation of nitrate metal compounds in general	C01G 1/08

C04B 2235/444

Halide containing anions, e.g. bromide, iodate, chlorite

Definition statement

This place covers:

Halide containing anions as starting material for making ceramics, e.g. chlorate (ClO3-), bromide (Br-), iodate (IO3-), chlorite (ClO2-), or present as secondary phase in the sintered ceramic

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on halogenides other than fluorides	C04B 35/5152
Coating or impregnating ceramic substrates with salts or salty compositions: containing halogen in the anion	C04B 41/5011
Products characterised by the absence or the low content of halogenides	C04B 2235/724
Halogens per se	C01B 7/00, C01B 9/00, C01B 11/00 and subgroups
Halides of sodium, potassium or alkali metals in general	C01D 3/00 and subgroups
Lithium halides	C01D 15/04
Preparation of halide metal compounds in general	C01G 1/06
Luminescent, e.g. electroluminescent, chemiluminescent materials containing inorganic halogenide compounds	C09K 11/0827 and subgroups, C09K 11/61 and subgroups

C04B 2235/445

Fluoride containing anions, e.g. fluosilicate

Definition statement

This place covers:

Fluoride containing anions as starting material for making ceramics, e.g. fluoride (F-), fluosilicate (SiF62-), or present as secondary phase in the sintered ceramic

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on fluorides	C04B 35/553
Coating or impregnating ceramic substrates with fluorides	C04B 41/5055
Catalysts containing fluoride	B01J 27/12
Fluorides per se	C01B 7/19 and subgroups, C01B 9/08, C01B 11/24
Fluorides of sodium, potassium or alkali metals in general	C01D 3/02

C04B 2235/446

Sulfides, tellurides or selenides

Definition statement

This place covers:

Sulphides, tellurides or selenides as starting material for making ceramics or present as secondary phase in the sintered ceramic

References

Limiting references

This place does not cover:

Non metallic elements as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. sulphur, phosphor, selenium or tellurium	C04B 2235/42 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on sulfides, selenides or tellurides	C04B 35/547
Coating or impregnating ceramic substrates with salts or salty compositions: containing sulphur in the anion, e.g. sulfides	C04B 41/5014
Coating or impregnating ceramic substrates with sulfides or selenides	C04B 41/5054
Products characterised by the absence or the low content of sulphur	C04B 2235/726
catalysts comprising sulfides	B01J 27/04 and subgroups
Sulphide compounds per se	C01B 17/20 and subgroups
Selenides and tellurides per se	C01B 19/007
Preparation of sulfides metal compounds in general	C01G 1/12
Luminescent, e.g. electroluminescent, chemiluminescent materials containing sulfides	C09K 11/56 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing two or more rare earth metals: Oxysulfides	C09K 11/7771

C04B 2235/447

Phosphates or phosphites (calcium phosphates C04B 2235/3212), e.g. orthophosphate, hypophosphite

Definition statement

This place covers:

Phosphates or phosphites (calcium phosphates C04B 2235/3212) as starting material for making ceramics, e.g. orthophosphate (PO_4^{3-}), pyrophosphate ($P_2O_7^{4-}$), hypophosphite ($H_2PO_2^{-}$), or present as secondary phase in the sintered ceramic

References

Limiting references

This place does not cover:

Adding phosphoric acid or phosphates as binder	C04B 35/6306 and subgroups
Calcium phosphate as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. hydroxyapatite	C04B 2235/3212

Informative references

Attention is drawn to the following places, which may be of interest for search:

Phosphate cements	C04B 12/02 and subgroups
Use of inorganic materials as fillers, e.g. pigments, for mortars, concrete or artificial stone; Treatment of inorganic materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone: Phosphates, e.g. apatite	C04B 14/366
Phosphate muds used in making clay	C04B 33/132
Ceramics based on phosphates	C04B 35/447
Making fibres based on phosphates	C04B 35/62268
Coating or impregnating ceramic substrates with salts or salty compositions: containing phosphor in the anion, e.g. phosphates	C04B 41/5015
Coating or impregnating ceramic substrates with phosphates	C04B 41/5048, C04B 41/5092 (phosphate cements), C04B 41/67
Products characterised by the absence or the low content of phosphorus	C04B 2235/727
Phosphate catalysts	B01J 27/18 and subgroups, B01J 29/82 and subgroups
Preparation of phosphates per se, e.g. phosphates powder, not preparative to making a phosphates ceramic	C01B 25/26 and subgroups, C01B 37/002
Luminescent, e.g. electroluminescent, chemiluminescent materials containing phosphates	C09K 11/0855 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing phosphorus	C09K 11/70 and subgroups

Luminescent, e.g. electroluminescent, chemiluminescent materials containing arsenic, antimony or bismuth phosphates	C09K 11/7464 and subgroups
Luminescent, e.g. electroluminescent, chemiluminescent materials containing rare earth phosphates	C09K 11/7709 and subgroups C09K 11/7723 and subgroups, C09K 11/7737 and subgroups C09K 11/7752 and subgroups , C09K 11/7777 and subgroups, C09K 11/7795 and subgroups

C04B 2235/448

Sulphates or sulphites

Definition statement

This place covers:

Sulphates (SO42-) or sulphites (SO3-)as starting material for making ceramics or present as secondary phase in the sintered ceramic

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating ceramic substrates with salts or salty compositions: containing sulphur in the anion, e.g. sulfides	C04B 41/5014
Products characterised by the absence or the low content of sulphur	C04B 2235/726
Sulphates per se	C01B 17/96 and subgroups
Sulphates or sulphites of sodium, potassium or alkali metals in general	C01D 5/00
Lithium sulphates, sulphites	C01D 15/06
Preparation of sulphate metal compounds in general	C01G 1/10
Luminescent, e.g. electroluminescent, chemiluminescent materials containing sulphates	C09K 11/0888

C04B 2235/449

Organic acids, e.g. EDTA, citrate, acetate, oxalate

Definition statement

This place covers:

Organic acids as starting material for making ceramics, e.g., EDTA, citrate, acetate, oxalate

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Organo metallic additives for making ceramics	C04B 35/6325

Special rules of classification

If C04B 2235/449 is used, C04B 35/6325 does not need to be used.

C04B 2235/46

Gases other than oxygen used as reactant, e.g. nitrogen used to make a nitride phase

Definition statement

This place covers:

Nitrogen is used for making a nitride, for instance a nitride powder is made by heating a metal powder in a nitrogen atmosphere. The residual metal or silicon phase of a ceramic is reacted to a nitride phase by heating in nitrogen atmosphere.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Reaction sintering N_2 to make Si_3N_4	C04B 35/591
Nitrides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. oxynitrides, carbonitrides, oxycarbonitrides, lithium nitride (Li_3N), magnesium nitride (Mg_3N_2)	C04B 2235/3852 and subgroups
Products characterised by the absence or the low content of nitrogen	C04B 2235/722

C04B 2235/465

Ammonia

Definition statement

This place covers:

Gases other than oxygen used as reactant for making a ceramic phase, e.g. ammonia used to make a nitride phase.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Reaction sintering NH_3 to make Si_3N_4	C04B 35/591

C04B 2235/48

Organic compounds becoming part of a ceramic after heat treatment, e.g. carbonising phenol resins

Definition statement

This place covers:

Organic compounds that through heat-treatment from carbon, carbide, boride, nitride, silicide and in some cases even an oxide, e.g. a (poly)siloxane is converted into a silica ceramic, or phenol resin in carbon or carbide.

References

Limiting references

This place does not cover:

Carbonaceous binders for oxide ceramics, the carbonaceous binder being formed by pyrolysis of an organic	C04B 35/013
Impregnating a porous carbon product with organic material that is carbonised into carbon	C04B 35/521
Carbon ceramic obtained from polymer precursors	C04B 35/524
Carbon products obtained from carbonaceous particles with a carbonisable binder	C04B 35/532
Pyrolysis, carbonisation or auto-combustion reactions of starting materials for making ceramics	C04B 35/6267
Bituminous additives for ceramic materials, e.g. tar, pitch	C04B 35/63496

Informative references

Attention is drawn to the following places, which may be of interest for search:

Organic additives for making clay products	C04B 33/1305
Ceramics based on oxide ceramics, containing carbon	C04B 35/013
Carbon based materials obtained from polymer precursors, e.g. glass-like carbon material	C04B 35/524
Carbon based materials obtained from carbonaceous particles with or without other non-organic components, containing a carbonisable binder	C04B 35/532
Silicon carbide materials obtained from Si-containing polymer precursors or organosilicon monomers	C04B 35/571
Silicon nitride materials obtained from Si-containing polymer precursors or organosilicon monomers	C04B 35/589
Using organic waste materials that become part of the ceramic, e.g. wood that is carbonised or rice bran	C04B 35/62204 and subgroups
Organic additives for ceramic compositions	C04B 35/632-C04B 35/6365
Organic additives that are added to the ceramic material to create porosity after a heat treatment	C04B 38/06 and subgroups
Non-oxides as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/38 and subgroups

Carbon as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/422 and subgroups
Metal salt constituents or additives chosen for the nature of the anions, e.g. hydrides or acetylacetonate, the salts being both organic and inorganic	C04B 2235/44 and subgroups
The addition of organic fibers	C04B 2235/5212
Decomposition of catalysts with carbon-containing compounds into carbon	B01J 37/084

Special rules of classification

In the case symbols from C04B 2235/48 are given, CPC symbols from C04B 35/63404-C04B 35/6365 can be given as well. For instance, phenol resin is carbonised in making a carbon ceramic. Both C04B 2235/48 and C04B 35/63476 are given.

With certain CPC groups it is obvious that a certain type of organic additive is converted into a ceramic material, since that is required for giving the class. This applies for the groups C04B 35/524, C04B 35/571, C04B 35/589 and C04B 35/83. For C04B 35/524 and C04B 35/83 a carbonisable organic has to be used, thus C04B 2235/48 does not need to be given.

If C04B 2235/48 or one of its groups symbols is given, C04B 35/6267 does not need to be given anymore, since C04B 2235/48 means that a pyrolysis has to take place.

C04B 2235/483

Si-containing organic compounds, e.g. silicone resins, (poly)silanes, (poly)siloxanes or (poly)silazanes

Definition statement

This place covers:

pyrolysing silicone resins, (poly)silanes, (poly)siloxanes, (poly)silazanes etc.

References

Limiting references

This place does not cover:

Silicon carbide made from silicon containing polymers or pre-polymers	C04B 35/571
Silicon nitride made from silicon containing polymers or pre-polymers	C04B 35/589

Informative references

Attention is drawn to the following places, which may be of interest for search:

Organic silicon containing compounds used in coating ceramic substrates	C04B 41/4905 and subgroups, C04B 41/84
Silicon oxide, silicic acids, or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. silica sol, fused silica, silica fume, cristobalite, quartz or flint (glass constituents C04B 2235/36), e.g. silicic acid $H_2Si_2O_5$	C04B 2235/3418
Silicon carbides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. SiC or SiOC	C04B 2235/3826 and subgroups

Silicon nitrides as starting material for making a ceramic or as secondary phase of a sintered ceramic, e.g. Si_3N_4, silicon carbonitride or silicon oxynitride (SiON)	C04B 2235/3873 and subgroups
Preparation of halogenated silanes	C01B 33/107 and subgroups
polysiloxanes	C08G 77/04, C08L 83/04 and sub-classes

Special rules of classification

For C04B 35/571 and C04B 35/589 a Si-containing organic has to be used, therefore C04B 2235/483 does not need to be given.

C04B 2235/486

Boron containing organic compounds, e.g. borazine, borane or boranyl

Definition statement

This place covers:

Boron-containing organic compounds becoming part of a ceramic after heat treatment, e.g. borazine, borane or boranyl

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Boron oxide, borates, boric acids, or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. boric acid (HBO2)	C04B 2235/3409
Borides as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/3804 and subgroups
Boron carbide as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. B4C	C04B 2235/3821
Boron nitrides as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/386
Carbonyl compounds derived from boron hydrides	C01B 35/1018
Boron oxyacids	C01B 35/1045 and subgroups
Compounds containing boron and nitrogen, phosphorus, sulphur, selenium or tellurium	C01B 35/14 and subgroups

C04B 2235/50

Constituents or additives of the starting mixture chosen for their shape or used because of their shape or their physical appearance

Definition statement

This place covers:

These starting materials for making ceramics all have a specific shape, e.g. fiber, whisker, sphere, or have a specific size, e.g. nano-sized, micro-sized

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Reinforced clay wares	C04B 33/36
Ceramic products containing macroscopic reinforcing agents, e.g. fibers	C04B 35/71 and subgroups

C04B 2235/52

Constituents or additives characterised by their shapes

Definition statement

This place covers:

These starting materials for making ceramics all have a specific shape, e.g. fiber, whisker, sphere

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Inorganic particles per se, characterised by the particle morphology	C01P 2004/00 and subgroups

C04B 2235/5204

Monocrystalline powders

Definition statement

This place covers:

Non agglomerated powders, non aggregated powders, powders in which the crystallites are present as individual particles that can disperse all individually in a liquid.

C04B 2235/5208

Fibers

Definition statement

This place covers:

The addition of fibers to ceramic mixtures for making a ceramic object

References

Limiting references

This place does not cover:

Making ceramic fibers per se	C04B 35/62227 and subgroups
Mechanical aspects of shaping ceramic objects containing fibers	B28B 1/52
The synthesis of glass fibers	C03B 37/01 and subgroups
Glass-ceramic fiber compositions	C03C 13/006
Making carbon fibers per se	D01F 9/12

Informative references

Attention is drawn to the following places, which may be of interest for search:

Clay wares reinforced with fibers	C04B 33/36
Coating ceramic and carbon fibers	C04B 35/62844 and subgroups
Ceramic material reinforced with fibers	C04B 35/71 and subgroups, e.g. C04B 35/83, C/C composites
Coating or impregnating ceramic substrates with fibers or whiskers	C04B 41/4596
Fibers with a defined aspect ratio	C04B 2235/5296
Fiber or whisker reinforced substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/38
Making metallic fibers per se	B22F 1/004
Glass fibre or filament compositions	C03C 13/00 and subgroups
Use of inorganic fibers as ingredient for polymers	C08K 7/02 and subgroups
Fibers of inorganic material, not being glass or ceramic	D01F 9/12

Special rules of classification

The method of making the fibers is usually classified in D01, e.g. spinning or electro-spinning ceramic fibers.

If the making of ceramic fibers is not described but just the use of them in a ceramic composite is mentioned, C04B 35/62227 is not used, but C04B 2235/5208 and its subgroups symbols together with C04B 35/80 and it's subgroups.

The making of ceramic fibers is normally not classified in the general oxide classes C04B 35/01-C04B 35/51 or general non-oxide classes C04B 35/515-C04B 35/597, unless the fiber composition is a new composition for that material in general or in the case the synthesis contains a new aspect that would be applicable also for making a bulk ceramic, e.g. using a new combination of starting materials that also could be used to make a bulk ceramic.

C04B 2235/5212

Organic

Definition statement

This place covers:

Organic fibers, e.g. polymeric fibers, used in making a ceramic

References

Limiting references

This place does not cover:

Organic fibers added to ceramic starting mixtures in order to be removed for creating porosity	C04B 38/06 and subgroups
Mechanical aspects of shaping ceramic objects containing organic fibers	B28B 1/525

Informative references

Attention is drawn to the following places, which may be of interest for search:

organic or organic mineral precursor fibers as filler for concrete, cement, mortar or artificial stone	C04B 14/4625
Polymeric fibers or whiskers added as filler to concrete, cement, mortar or artificial stone	C04B 16/06 and subgroups
Organic additives for clay mixtures	C04B 33/1305
Cellulose as starting material for making a ceramic	C04B 35/6365

C04B 2235/5216

Inorganic

Definition statement

This place covers:

Inorganic fibers or whiskers, normally ceramic fibers used as starting material for making a ceramic.

References

Limiting references

This place does not cover:

Making ceramic fibers	C04B 35/62227 and subgroups
The use of metal fibers as reinforcement of ceramics	C04B 35/76
Making metallic fibers per se	B22F 1/004
The synthesis of glass fibers	C03B 37/01 and subgroups
Glass fibre or filament compositions	C03C 13/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Fibrous materials and whiskers added to cement, concrete, mortar or artificial stone	C04B 14/38 and subgroups C04B 20/0048 and subgroups
Compositions for artificial stone, not containing binders, containing fibrous materials	C04B 30/02
Coating ceramic and carbon fibers	C04B 35/62844 and subgroups
Ceramic material reinforced with fibers	C04B 35/71 and subgroups, e.g. C04B 35/83, C/C composites
Glass compositions containing a non-glass component, e.g. compositions containing fibres, filaments, whiskers, platelets, or the like, dispersed in a glass matrix	C03C 14/00

C04B 2235/522

Oxidic

Definition statement

This place covers:

All fibers or whiskers that as a material are classified in the classes C04B 35/01-C04B 35/51, e.g. magnesia, ferrite, chromite, phosphate, titania, titanate fibers, used as starting material for making a ceramic, used as starting material for making a ceramic

References

Limiting references

This place does not cover:

Making ceramic oxide fibers	C04B 35/62231 and subgroups
The use of asbestos, glass or fused silica fibers as reinforcement for ceramics	C04B 35/82

Informative references

Attention is drawn to the following places, which may be of interest for search:

oxidic fibers as filler for concrete, cement, mortar or artificial stone	C04B 14/46 and subgroups
Coating fibers with oxide ceramic	C04B 35/62847 and subgroups
The synthesis of glass fibers	C03B 37/01 and subgroups
Use of inorganic oxygen-containing fibers as ingredient for polymers	C08K 7/08

C04B 2235/5224

Alumina or aluminates

Definition statement

This place covers:

ceramic fibers or whiskers based on aluminium oxide ceramics, e.g. spinel, alumina, YAG (yttrium aluminate garnet) fibers, used as starting material for making a ceramic

References

Limiting references

This place does not cover:

The obtaining of fibers based on aluminium oxide	C04B 35/62236
The obtaining of fibers based on alumino-silicates	C04B 35/62245

Informative references

Attention is drawn to the following places, which may be of interest for search:

alumina fibers as filler for concrete, cement, mortar or artificial stone	C04B 14/4625
Coating fibers with alumina or aluminates	C04B 35/62852
Aluminium oxide or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. bauxite, alpha-alumina	C04B 2235/3217 and subgroups

C04B 2235/5228

Silica and alumina, including aluminosilicates, e.g. mullite

Definition statement

This place covers:

ceramic fibers or whiskers based on alumino-silicate ceramics, e.g. mullite, cordierite, kyanite, zeolite, spodumene, vermiculite, albite, anorthite fibers, used as starting material for making a ceramic

References

Limiting references

This place does not cover:

The obtaining of fibers based on aluminium oxide	C04B 35/62236
The obtaining of fibers based on silica	C04B 35/6224
The obtaining of fibers based on alumino-silicates	C04B 35/62245

Informative references

Attention is drawn to the following places, which may be of interest for search:

alumino-silicate fibers as filler for concrete, cement, mortar or artificial stone	C04B 14/4656
Coating fibers with silica or silicates, e.g. alumino-silicates	C04B 35/62849

Alumino-silicates other than clay as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. mullite (3Al2O3-2SiO2)	C04B 2235/3463 and subgroups

C04B 2235/5232

Silica or silicates other than aluminosilicates, e.g quartz

Definition statement

This place covers:

ceramic fibers or whiskers based on silicon oxide ceramics, e.g. silica, forsterite, wollastonite fibers, used as starting material for making a ceramic

References

Limiting references

This place does not cover:

The obtaining of fibers based on silica	C04B 35/6224
The obtaining of fibers based on alumino-silicates	C04B 35/62245
The synthesis of silica based glass or glass-ceramic fibers	C03B 37/01 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

silica fibers as filler for concrete, cement, mortar or artificial stone	C04B 14/4631
silicate fibers as filler for concrete, cement, mortar or artificial stone	C04B 14/4656 and subgroups
Coating fibers with silica or silicates, e.g. alumino-silicates	C04B 35/62849
Silicon oxide, silicic acids, or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. silica sol, fused silica, silica fume, cristobalite, quartz or flint (glass constituents C04B 2235/36), e.g. silicic acid $H_2Si_2O_5$	C04B 2235/3418
Silicates other than clay as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. water glass (Na_2SiO_3)	C04B 2235/3427 and subgroups
Use of inorganic silicon-containing fibers as ingredient for polymers	C08K 7/08 and subgroups

C04B 2235/5236

Zirconia

Definition statement

This place covers:

ceramic fibers or whiskers based on zirconium oxide ceramics, e.g. zirconia, YSZ (yttria-stabilised-zirconia), zircon, zirconate, zirconate-titanates such as PZT (lead zirconate titanate) fibers, used as starting material for making a ceramic

References

Limiting references

This place does not cover:

The obtaining of fibers based on zirconia, e.g. zirconates such as PZT	C04B 35/6225

Informative references

Attention is drawn to the following places, which may be of interest for search:

zirconia or zircon fibers as filler for concrete, cement, mortar or artificial stone	C04B 14/4637
Coating fibers with refractory metal oxides	C04B 35/62855
Zirconium or hafnium oxides or oxide forming salts thereof as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. HfO2	C04B 2235/3244 and subgroups

C04B 2235/524

Non-oxidic, e.g. borides, carbides, silicides or nitrides

Definition statement

This place covers:

ceramic fibers or whiskers based on ceramics having as the largest fraction a non-oxide material, e.g. a carbide, nitride, boride, silicide, fluoride, sulphide, selenide

References

Limiting references

This place does not cover:

The obtaining of fibers based on non-oxides	C04B 35/62272 and subgroups
The use of carbon fiber as reinforcement for a carbon matrix	C04B 35/83
The synthesis of carbon nanotubes	C01B 31/0206
The synthesis of carbon fibers	D01F 9/12, D10B 2101/12

Informative references

Attention is drawn to the following places, which may be of interest for search:

non-oxide fibers as filler for concrete, cement, mortar or artificial stone	C04B 14/4687 and subgroups
Coating fibers with non-oxide ceramics	C04B 35/62828 and subgroups
Non-oxide glass compositions for glass fibers	C03C 13/041 and subgroups

C04B 2235/5244

Silicon carbide

Definition statement

This place covers:

ceramic fibers based on ceramics having as the largest fraction a silicon carbide phase, e.g. alpha- or beta-silicon carbide or silicon oxy-carbide, silicon carbide whiskers, sialon fibers or whiskers

References

Limiting references

This place does not cover:

The obtaining of silicon carbide based fibers or whiskers	C04B 35/62281
The obtaining of silicon carbo-nitride based fibers or whiskers	C04B 35/62295
Silicon carbides as starting material for making ceramics or as secondary phase of a sintered ceramic, e.g. SiC or SiOC	C04B 2235/3826 and subgroups
The use of silicon carbo-nitride fibers in ceramic compositions	C04B 2235/524

Informative references

Attention is drawn to the following places, which may be of interest for search:

silicon carbide fibers as filler for concrete, cement, mortar or artificial stone	C04B 14/4693
Coating fibers with silicon carbide	C04B 35/62863

C04B 2235/5248

Carbon, e.g. graphite

Definition statement

This place covers:

All carbon fibers used as starting material for making a ceramic, e.g. carbon, pitch, graphite fibers or whiskers

References

Limiting references

This place does not cover:

The use of carbon fiber as reinforcement for a carbon matrix	C04B 35/83
The use of carbon nanotubes as starting material for making a ceramics	C04B 2235/5288
The synthesis of carbon nanotubes	C01B 31/0206
The synthesis of carbon fibers	D01F 9/12, D10B 2101/12

Informative references

Attention is drawn to the following places, which may be of interest for search:

Carbon fibers or whiskers added as filler to concrete, cement, mortar or artificial stone	C04B 14/386
Coating fibers with carbon	C04B 35/62873
Carbon as starting material for making ceramics or as secondary phase of a sintered ceramic	C04B 2235/422 and subgroups
Carbon fiber or whisker reinforced substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/385

C04B 2235/5252

having a specific pre-form

Definition statement

This place covers:

Fibers that have been assembled into a specific form, for instance a 3D form

References

Limiting references

This place does not cover:

Fiber pre-forms used in metallic alloys	C22C 47/06 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cement, concrete, mortar or artificial stone mixtures as ceramic preforms for the fabrication of metal matrix comp, e.g. cermets	C04B 2111/00913 and subgroups

C04B 2235/5256

Two-dimensional, e.g. woven structures

Definition statement

This place covers:

Fibers that have been assembled into a specific two-dimensional form, for instance by weaving or pressing

C04B 2235/526

charachterised by the length of the fibers

Definition statement

This place covers:

The length of the individual fibers is specified, e.g. 100 nm or 1 mm. Is also used for other elongated particles that are classified with C04B 2235/5276, e.g. whiskers, needles, pins, spindles.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Fibers with a defined aspect ratio	C04B 2235/5296
Particle size related information of particles used for making ceramics	C04B 2235/54 and subgroups

C04B 2235/5264

charachterised by the diameter of the fibers

Definition statement

This place covers:

The diameter of the individual fibers is specified, e.g. 100 nm or 1 mm. Is also used for other elongated particles that are classified with C04B 2235/5276, e.g. whiskers, needles, pins, spindles.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Fibers with a defined aspect ratio	C04B 2235/5296
Particle size related information of particles used for making ceramics	C04B 2235/54 and subgroups

C04B 2235/5268

Orientation of the fibers

Definition statement

This place covers:

The fibers are for instance intentionally randomly oriented, or are oriented parallel, or are aligned to a certain degree

References

Limiting references

This place does not cover:

Fibers oriented parallel through weaving	C04B 2235/5256
Oriented fibers used in metallic alloys	C22C 47/025

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cement, concrete, mortar or artificial stone mixtures containing oriented fibers	C04B 2111/00379

C04B 2235/5272

Fibers of the same material with different length or diameter

Definition statement

This place covers:

The ceramic mixture contains different fibers of the same material, e.g. alumina fibers of 1 mm length and of 5 mm length, or carbon fibers of 100 nm thickness and of 200 nm thickness.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Fibrous materials and whiskers added to cement, concrete, mortar or artificial stone: mixtures of fibres of different physical characteristics, e.g. different lengths	C04B 20/0052
Fibers with a defined aspect ratio	C04B 2235/5296

C04B 2235/5276

Whiskers, spindles, needles or pins

Definition statement

This place covers:

Starting materials added to ceramics where they have an aspect ratio of greater than 1, but are not that long as to be considered a fiber, e.g. whiskers, spindles, needles, pins.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Whiskers added as filler to concrete, cement, mortar or artificial stone	C04B 14/383
Whiskers, spindles, needles, pins with a defined aspect ratio	C04B 2235/5296
Inorganic particles per se, extending in one dimension, e.g. needle-like	C01P 2004/10 and subgroups

C04B 2235/528

Spheres

Definition statement

This place covers:

Particles of which it is mentioned that they are spherical, or that have an aspect ratio as close to 1 as possible.

References

Limiting references

This place does not cover:

addition of hollow spheres for creating porosity	C04B 38/009

Informative references

Attention is drawn to the following places, which may be of interest for search:

Spheres with a defined aspect ratio	C04B 2235/5296
Spherical metallic particles	B22F 1/0048
Inorganic spherical particles per se	C01P 2004/32 and subgroups

C04B 2235/5284

Hollow fibers, e.g. nanotubes

Definition statement

This place covers:

Fibers that are characterised by the fact that they are hollow. Most are nanotubes.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

nanotubes used as filler in mortars, concrete or artificial stone	C04B 14/026
Nanotubes with a defined aspect ratio	C04B 2235/5296
metallic nanofibers or nanotubes	B22F 1/0025
Inorganic nanotubes per se	C01P 2004/13 and subgroups

C04B 2235/5288

Carbon nanotubes

Definition statement

This place covers:

All carbon nanotubes used as starting material for making ceramics, e.g. single wall nanotubes (SWNT, SWCNT), multi wall nanotubes (MWNT, MWCNT). Nanofibers often are in fact nanotubes.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Catalysts comprising carbon nanotubes	B01J 21/185, B01J 21/185

The preparation and after-treatment of carbon nanotubes	C01B 31/022 and subgroups
Structure or properties of carbon nanotubes	C01B 2202/00 and s subgroups

C04B 2235/5292

Flakes, platelets or plates

Definition statement

This place covers:

All particles used for making ceramics that are flat, e.g. graphite flakes

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Minute sintered alumina entities, e.g. sintered abrasive grains or shaped particles such as platelets	C04B 35/1115
Flakes, platelets or plates with a defined aspect ratio	C04B 2235/5296
Flake metallic powder per se	B22F 1/0055
Inorganic particles per se, extending in two dimension, e.g. plate-like	C01P 2004/20 and subgroups

C04B 2235/5296

with a defined aspect ratio, e.g. indicating sphericity (spherical constituents C04B 2235/528)

Definition statement

This place covers:

All solid starting materials for making ceramics, e.g. fibers, whiskers, spindles, pins, nanotubes, spheres, flakes, platelets, that have a defined aspect ratio (or a so called D/H ratio)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Spherical particles used for making ceramics	C04B 2235/528
Spherical metallic powder per se	B22F 1/0048
Inorganic particles per se characterised by their aspect ratio, i.e. the ratio of sizes in the longest to the shortest dimension	C01P 2004/54

C04B 2235/54

Particle size related information

Definition statement

This place covers:

Information that relates to the size of the particles that are used for making a ceramic. Can apply both to particles with a defined shape, e.g. whiskers, platelets, pins, flakes, spheres, as to particles of which the shape is not defined.

References

Limiting references

This place does not cover:

Aspect ratio of starting material, e.g. particles, spheres, whiskers, flakes, platelets, used for making a ceramic	C04B 2235/5296

Informative references

Attention is drawn to the following places, which may be of interest for search:

Decreasing the particle size of starting material for making a ceramic through milling	C04B 35/6262 and subgroups
Increasing the particle size of starting material for making a ceramic through granulation or pelletising	C04B 35/62695

C04B 2235/5409

expressed by specific surface values

Definition statement

This place covers:

The specific surface, for instance expressed by the BET-surface, of the particles, spheres, whiskers, platelets, flakes that are used as starting material for making a ceramic.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Surface area of inorganic powders per se	C01P 2006/12 and subgroups

C04B 2235/5418

expressed by the size of the particles or aggregates thereof

Definition statement

This place covers:

The particle size of particles, spheres, whiskers, platelets, flakes that are used as starting material for making a ceramic is specified. The code C04B 2235/5418 in principle has little use, since all possible particle size can be indicated by one of the sub-codes.

References

Limiting references

This place does not cover:

Length of fibers and other elongated particles such as whiskers and pins, used as starting material for making a ceramic	C04B 2235/526
Width of fibers and other elongated particles such as whiskers and pins, used as starting material for making a ceramic	C04B 2235/5264

Informative references

Attention is drawn to the following places, which may be of interest for search:

Inorganic particles per se characterised by their size	C01P 2004/60 and subgroups

C04B 2235/5427

millimeter or submillimeter sized, i.e. larger than 0,1 mm

Definition statement

This place covers:

The particle size of particles, spheres, whiskers, platelets, flakes that are used as starting material for making a ceramic is specified, where these particles can be larger than 100 microns.

C04B 2235/5436

micrometer sized, i.e. from 1 to 100 micron

Definition statement

This place covers:

The particle size of particles, spheres, whiskers, platelets, flakes that are used as starting material for making a ceramic is specified, where these particles can be in the size range of 1-100 microns.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on magnesia, the ceramic having a grain size below 100 microns (fine ceramic)	C04B 35/053

Ceramics based on alumina, the ceramic having a grain size below 100 microns (fine ceramic)	C04B 35/111 and subgroups
Ceramics based on zirconia, the ceramic having a grain size below 100 microns (fine ceramic)	C04B 35/486 and subgroups
Ceramics based on silicon nitride, the ceramic having a grain size below 100 microns (fine ceramic)	C04B 35/587
Inorganic particles per se characterised by their size: micrometer sized, i.e. from 1-100 micrometer	C01P 2004/61

C04B 2235/5445

submicron sized, i.e. from 0,1 to 1 micron

Definition statement

This place covers:

The particle size of particles, spheres, whiskers, platelets, flakes that are used as starting material for making a ceramic is specified, where these particles can be in the size range of 100-1000 nanometers.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Inorganic particles per se characterised by their size: submicrometer sized, i.e. from 0.1-1 micrometer	C01P 2004/62

C04B 2235/5454

nanometer sized, i.e. below 100 nm

Definition statement

This place covers:

The particle size of particles, spheres, whiskers, platelets, flakes that are used as starting material for making a ceramic is specified, where these particles can be in the size range of below 100 nanometers

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Powder used for coating or impregnating a ceramic substrate characterised by the grain distribution: nanometer sized particles	C04B 41/4549
Nanometer sized metallic particles	B22F 1/0044
Inorganic particles per se characterised by their size: nanometer sized, i.e. from 1-100 nanometer	C01P 2004/64

C04B 2235/5463

Particle size distributions

Definition statement

This place covers:

Information is give on how the particle size is distributed. This relates to particles of the same type only. It is mentioned how many particles of different size ranges for the same type of particle are present.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Fillers added to cement, concrete, mortar or artificial stone: characterised by the grain distribution	C04B 20/0076
Powder used for coating or impregnating a ceramic substrate characterised by the grain distribution	C04B 41/4547 and subgroups
Size distribution of metallic particles	B22F 1/0014
Inorganic particles per se with a specific particle size distribution	C01P 2004/51 and subgroups

C04B 2235/5472

Bimodal, multi-modal or multi-fraction

Definition statement

This place covers:

The document mentions that the inorganic starting materials of the same type e.g. all alumina, deliberately have different mesh sizes, such as a fraction of < 400 mesh, a fraction of 200-400 mesh and a fraction > 200 mesh, or the document mentions different particle sizes, e.g. two fractions, one with size below and one with size above 0,1 mm. A certain constituent is added with two different particle sizes, by adding for instance SiC with a size of 1 micron and SiC with a size of 10 micron. A powder is added that contains one fraction, but this fraction has a bimodal particle size distribution.

References

Limiting references

This place does not cover:

Clay powders consisting of a mixture of materials with different sizes, e.g. multi-fraction powder	C04B 33/025
Ceramic mixtures in which the organic additives have different size fractions	C04B 35/632 and subgroups
Mixtures of particles having different sizes, where the different sizes result from different types of particles, e.g. a mixture of alumina of 1 micron with silica of 0,1 micron	C04B 2235/5436, C04B 2235/5445

Informative references

Attention is drawn to the following places, which may be of interest for search:

Fillers added to cement, concrete, mortar or artificial stone: characterised by the grain distribution: fillers with bimodal grain size distribution	C04B 20/0096
Separation of particles of different sizes through sedimentation	B01D 21/00 and subgroups
Inorganic particles per se with a bimodal particle size distribution	C01P 2004/53

C04B 2235/5481

Monomodal

Definition statement

This place covers:

A certain powder consisting of one type of material, e.g. only alumina particles, only zirconia spheres, only silica sol particles, only silicon carbide whiskers, is used as starting material for making a ceramic and has a narrow distribution of the particle size.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Fillers added to cement, concrete, mortar or artificial stone: characterised by the grain distribution: fillers with mono- or narrow grain size distribution	C04B 20/0088
Inorganic particles per se with a highly monodisperse size distribution	C01P 2004/52

C04B 2235/549

the particle size being expressed by crystallite size or primary particle size

Definition statement

This place covers:

It is specified that the mentioned particle size is not of the agglomerates/aggregates, as is usual, but of the individual crystals/crystallites, that possibly are assembled together into larger particles (agglomerates/aggregates).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Monocrystalline powder used as starting material for making a ceramic	C04B 2235/5204
Inorganic powders characterised by their crystallite size	C01P 2002/60

C04B 2235/60

Aspects relating to the preparation, properties or mechanical treatment of green bodies or pre-forms

Definition statement

This place covers:

The shaping of the starting materials for making a ceramic into a certain shape, the so called green body, which is not yet heat treated into a sintered ceramic.

Relationships with other classification places

Mechanical aspects of the shaping of ceramics B28B

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating green ceramic bodies	C04B 41/4578 and subgroups

C04B 2235/602

Making the green bodies or pre-forms by moulding

Definition statement

This place covers:

Using a mould for shaping the starting mixture for making a ceramic into a green ceramic

References

Limiting references

This place does not cover:

The mechanical aspects of the ceramic moulding techniques	B28B

Informative references

Attention is drawn to the following places, which may be of interest for search:

Compositions of refractory mould or core materials; Grain structures thereof; Chemical or physical features in the formation or manufacture of moulds	B22C 1/00 and subgroups
Moulds and cores and moulding processes for making metallic articles	B22C 9/00 and subgroups
Moulds for plastic materials	B29C 33/00 and subgroups

C04B 2235/6021

Extrusion moulding

Definition statement

This place covers:

Extrusion moulding is a manufacturing process used to make pipes, hoses, drinking straws, curtain tracks, rods, and fibres. The machine used to extrude materials is very similar to an injection moulding machine. A motor turns a screw which feeds granules of plastic through a heater. The granules melt into a liquid which is forced through a die, forming a long 'tube like' shape. The shape of the die determines the shape of the tube. The extrusion is then cooled and forms a solid shape. The tube may be printed upon, and cut at equal intervals. The pieces may be rolled for storage or packed together. Shapes that can result from extrusion include T-sections, U-sections, square sections, I-sections, L-sections and circular sections.

References

Limiting references

This place does not cover:

Mechanical aspects of extruding ceramic mixtures	B28B 3/20 and subgroups, B28B 21/52 and subgroups (tubes)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Extrusion of cement, concrete, mortar or artificial stone	C04B 2111/00129
Extrusion of metallic objects	B22F 3/20 and subgroups, B22F 3/227
Extrusion of plastics	B29C 47/00 and subgroups s

C04B 2235/6022

Injection moulding

Definition statement

This place covers:

a manufacturing process for producing parts using both thermoplastic and thermosetting plastic materials for the plasticity of the ceramic mixture. Material is fed into a heated barrel, mixed, and forced into a mould cavity where it cools and hardens to the configuration of the cavity. After a product is designed, usually by an industrial designer or an engineer, moulds are made by a moldmaker (or toolmaker) from metal, usually either steel or aluminum, and precision-machined to form the features of the desired part.

References

Limiting references

This place does not cover:

Mechanical aspects of injection moulding ceramic materials	B28B 1/24 (general), B28B 1/265 (ceramic slips) , B28B 21/38 (tubes)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Injection moulding of cement, concrete, mortar or artificial stone	C04B 2111/00137
Making metallic articles by injection moulding	B22F 3/225
Making plastic articles by injection moulding	B29C 45/00 and subgroups

C04B 2235/6023

Gel casting

Definition statement

This place covers:

Gel casting is a method in which a ceramic powder is mixed with a liquid in order to make a slurry. The slurry also contains organic monomers. The monomers are subsequently polymerised. Due to the formation of the polymeric network the slurry is solidified. After solidification the gel cast object is dried and sintered, thereby burning away the polymer.

References

Limiting references

This place does not cover:

sol-gel processing	C04B 35/624

C04B 2235/6025

Tape casting, e.g. with a doctor blade

Definition statement

This place covers:

Tape casting is a casting process used in the manufacture of thin ceramic tapes from ceramic slurry. The feed stock for the tape casting process is a slip made from a suspension of ceramic, metal or polymer particles in an organic solvent or water, mixed together with strengthening plasticizers and/or binders. The actual tape is formed when the slip is cast onto a flat surface by doctor blade to a carrier film or steel belt.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Obtaining ceramics films, e.g. by using temporary support	C04B 35/62218
Inert electrodes with catalytic activity, e.g. for fuel cells, obtained by casting, e.g. tape casting, vacuum slip casting	H01M 4/8857, H01M 4/8857

Special rules of classification

If C04B 2235/6025 is given, C04B 35/62218 does not need to be given anymore.

C04B 2235/6026

Computer aided shaping, e.g. rapid prototyping

Definition statement

This place covers:

All methods that use a robot system for 3D shaping, such as rapid prototyping. The use of additive manufacturing for rapid prototyping takes virtual designs from computer aided design (CAD) or animation modelling software, transforms them into thin, virtual, horizontal cross-sections and then creates successive layers until the model is complete. Some solid freeform fabrication techniques use two materials in the course of constructing parts. The methods that can be used are 3D printing, stereolithography.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cement, concrete, mortar or artificial stone mixtures specially adapted for three-dimensional printing (3DP), stereo-lithography or prototyping	C04B 2111/00181
using stereolithographic techniques for making dental prostheses	A61C 13/0013, A61C 13/0013
using 3D printing for making dental prostheses	A61C 13/0019, A61C 13/0019
Implantable joints made by stereolithography	A61F 2002/30962
Implantable joints made by 3D printing	A61F 2002/30985
Rapid manufacturing and prototyping of 3D objects by additive depositing, agglomerating or laminating of plastics material, e.g. by stereolithography or selective laser sintering	B29C 67/0051, B29C 67/0051 and subgroups
Devices or arrangements of selective printing mechanisms, e.g. ink-jet printers, thermal printers, for supporting or handling copy material in sheet or web form: for treating before, during or after printing or for uniform coating or laminating the copy material before or after printing	B41J 11/0015 and subgroups
Photomechanical, e.g. photolithographic, production of textured or patterned surfaces, e.g. printing surfaces; Materials therefore, e.g. comprising photoresists; Apparatus specially adapted therefore	G03F 7/00 and subgroups

C04B 2235/6027

Slip casting

Definition statement

This place covers:

This is where slip, liquid clay, is poured into a plaster mould. The water in the slip is drawn out of the slip, leaving an inside layer of solid clay. When this is thick enough, the excess slip can be removed from the mould. When dry, the solid clay can then also be removed. The slip used in slip casting is often liquefied with a substance that reduces the need for additional water to soften the slip; this prevents excessive shrinkage which occurs when a piece containing a lot of water dries

References

Limiting references

This place does not cover:

The slip casting of clay/porcelain mixtures	C04B 33/28
Mechanical features of slip-casting ceramic materials	B28B 1/26 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Making a clay slurry	C04B 33/18
semi-permeable membranes for separation processes made by slurry techniques, e.g. die or slip-casting	B01D 67/0046
Slip casting metallic articles	B22F 3/22
Making clay or ceramic tubular articles by slip casting and moulds therefore	B28B 21/08
Slip casting plastics	B29C 41/16
Inert electrodes with catalytic activity, e.g. for fuel cells, obtained by casting, e.g. tape casting, vacuum slip casting	H01M 4/8857, H01M 4/8857

C04B 2235/6028

Shaping around a core which is removed later

Definition statement

This place covers:

A ceramic is shaped (partially) around for instance a polymeric object or a wax object with a certain form, possibly in a mould. The polymer or wax is removed after shaping by melting or burning, leaving the ceramic with a certain, hollow shape. The core could also be made of metal or glass, which can be melted away.

References

Limiting references

This place does not cover:

Creating porous ceramics by dissolving-out added substances	C04B 38/04

Creating porous ceramics by burning-out added substances by burning natural expanding materials or by sublimating or melting out added substances	C04B 38/06 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Creating a porous ceramic by dissolving-out added substances, the dissolved-out substance being a monolithic element having approximately the same dimensions as the final article, e.g. a prepreg obtained by bonding together dissolvable particles	C04B 38/045
Creating porous ceramics by burning-out added substances: the burned-out substance being a monolithic element having approximately the same dimensions as the final article, e.g. a porous polyurethane sheet or a prepreg obtained by bonding together resin particles	C04B 38/0615 and subgroups
Forming ceramic laminates or joined ceramic articles comprising holes, channels or other types of openings	C04B 2237/62

C04B 2235/604

Pressing at temperatures other than sintering temperatures

Definition statement

This place covers:

Dry pressing of ceramic powder mixtures, possibly with heating but below the sintering temperature, either through uniaxial pressing (pressing from one side) or isostatic pressing (pressing from all sides).

Relationships with other classification places

Presses in general B30B

References

Limiting references

This place does not cover:

Pressing of clay mixtures	C04B 33/20
Pressing a starting mixture for making a ceramic in an injection moulding machine	C04B 2235/6022
Mechanical aspects of pressing ceramic materials	B28B 3/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pressing of clay mixtures at sintering temperature	C04B 33/326
Granulation or pelletising of starting material for making a ceramic	C04B 35/62695
Pressing of ceramic mixtures at sintering temperature	C04B 35/645 and sub-class
Making metallic articles by compacting	B22F 3/02 and subgroups

Press moulds and press-ram assemblies for shaping clay or other ceramic compositions	B28B 7/0097

C04B 2235/605

Making or treating the green body or pre-form in a magnetic field

Definition statement

This place covers:

Pressing, moulding, casting or using any other shaping technique while at the same time a magnetic field is applied to the mixture that is being shaped, in order to influence the material that is being shaped.

References

Limiting references

This place does not cover:

Manufacturing of magnetic circuits by moulding or by pressing powder	H01F 41/0246, H01F 41/0246
manufacturing permanent magnets by Moulding; Pressing	H01F 41/0266, H01F 41/0266

C04B 2235/606

Drying

Definition statement

This place covers:

Drying of shaped ceramic bodies, e.g. green ceramics, moulded bodies, cast ceramic bodies.

Relationships with other classification places

Drying solid materials or objects by removing liquid therefrom F26B

References

Limiting references

This place does not cover:

Drying clay or porcelain powder mixtures or clay green bodies	C04B 33/30
Drying, e.g. freeze-drying, spray-drying, microwave or supercritical drying of powder mixtures, slurries	C04B 35/62655
Curing of starting mixtures for making ceramics or of green bodies	C04B 35/6269
Mechanical aspects of drying a green ceramic body	B28B 11/243

Informative references

Attention is drawn to the following places, which may be of interest for search:

involving the removal of at least part of the materials of the treated article, e.g. etching, drying of hardened concrete	C04B 41/53 and subgroups

processing clay- or ceramic containing substances in non-fluid condition by heating, drying	B28C 1/227
Surface treatment of glass not in the form of fibres or filaments: drying; dehydroxylation	C03C 23/0085

C04B 2235/608

Green bodies or pre-forms with well-defined density

Definition statement

This place covers:

The density of the green body (the green density) is specified, or the density of a pre-form is mentioned.

References

Limiting references

This place does not cover:

Intentionally porous ceramics	C04B 38/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Density of sintered ceramics	C04B 2235/77 and subgroups

C04B 2235/61

Mechanical properties, e.g. fracture toughness, hardness, Young's modulus or strength

Definition statement

This place covers:

At least one (or more) mechanical property of the green ceramic body, or ceramic pre-form, such as a fiber form, is measured and mentioned. This can be the strength, e.g. bending or compressive strength, the toughness, hardness, the stiffness determined by the modulus of elasticity, etc.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Mechanical properties of sintered ceramics	C04B 2235/96

C04B 2235/612

Machining

Definition statement

This place covers:

All methods that lead to the removal of at least a part of the green body or preform, while leaving the green body or perform at a smaller size, e.g. grinding or polishing to smoothen the surface, cutting or grinding the green body into different parts.

References

Limiting references

This place does not cover:

Destroying a green body or pres-sintered ceramic by milling	C04B 35/6262
Cutting ceramic objects	B28B 11/12 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramic products characterised by their shape	C04B 2235/94 and subgroups
Ceramic products characterised by their size	C04B 2235/95

C04B 2235/614

Gas infiltration of green bodies or pre-forms

Definition statement

This place covers:

Gas phase techniques, such as CVD (chemical vapour deposition), PVD (physical vapour deposition) are used to infiltrate a porous green body, a preform, a fiber body, a partially sintered ceramic, in principle any ceramic body that still has open porosity, and leave a deposit inside the open pores.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating of inorganic particles or of fibers applied by a gas phase technique	C04B 35/62884
Porous ceramics in general	C04B 38/00 and subgroups
Coating or impregnating a ceramic substrate applied from the gas phase	C04B 41/4529 and subgroups
Non-superficial impregnation or infiltration of the substrate	C04B 41/457
Gases other than oxygen used as reactants, e.g. nitrogen	C04B 2235/46 and subgroups

Inorganic membrane formation by deposition from the gaseous phase, e.g. sputtering, CVD, PVD	B01D 67/0072, B01D 67/0072
PVD, CVD methods or coating in a gas-phase using a fluidized bed of preparing the interference pigments	C09C 2220/20
Coating metallic substrates by chemical coating by decomposition of gaseous compounds, without leaving reaction products of the surface material in the coating, e.g. chemical vapour deposition (CVD) processes	C23C 16/00 and subgroups

C04B 2235/616

Liquid infiltration of green bodies or pre-forms

Definition statement

This place covers:

Infiltrating a porous green body, a preform, a fiber body, a partially sintered ceramic, in principle any ceramic body that still has open porosity with for instance liquid silicon, or with a solution of organic carbonisable material, or with carbonisable liquid polymer and leave a deposit inside the open pores.

Relationships with other classification places

Making ceramic powders by gas phase techniques C01

References

Limiting references

This place does not cover:

Ceramics based on carbon, made by impregnation of a carbon product with carbonisable material	C04B 35/521
Joining two substrates of which at least one is porous by infiltrating the porous substrate with a liquid, such as a molten metal, causing bonding of the two substrates, e.g. joining two porous carbon substrates by infiltrating with molten silicon	C04B 2237/61

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating of inorganic particles or of fibers applied by wet chemical techniques	C04B 35/62886
Porous ceramics in general	C04B 38/00 and subgroups
Coating or impregnating a ceramic substrate applied as a solution, emulsion, dispersion or suspension	C04B 41/4535 and subgroups
Non-superficial impregnation or infiltration of the substrate	C04B 41/457
Chemically coating metallic substrates by decomposition of either liquid compounds or solutions	C23C 18/00 and s subgroups
Chemically coating metallic substrates by decomposition of either solid compounds or suspensions	C23C 20/00 and subgroups

C04B 2235/65

Aspects relating to heat treatments of ceramic bodies such as green ceramics or pre-sintered ceramics, e.g. burning, sintering or melting processes

Definition statement

This place covers:

All heat treatments of ceramic green bodies, already sintered ceramics, joining treatment of a ceramic body that is joined with another body

Relationships with other classification places

Furnaces, kilns, ovens, or retorts F27

References

Limiting references

This place does not cover:

Drying of ceramic powders	C04B 35/62655
Curing of starting mixtures for making ceramics or of green bodies	C04B 35/6269
Superficial sintering of ceramic objects with the goal of creating a porous object	C04B 38/0038 and subgroups
Mechanical aspects of the heat treatments	B28B 11/243

Informative references

Attention is drawn to the following places, which may be of interest for search:

Heat treatment, e.g. precalcining, burning, melting; Cooling of hydraulic cements	C04B 7/43 and subgroups
Burning methods for clay wares	C04B 33/32 and subgroups
Heat treatments of ceramic powders	C04B 35/62645 and subgroups
Removing organic binders from a shaped green ceramic by burning them out	C04B 35/638
Sintering methods for shaped ceramic materials	C04B 35/64 and subgroups
Making ceramic materials by melting	C04B 35/653 and subgroups
Processes, in general, for influencing or modifying the properties of mortars, concrete or artificial stone compositions: making use of a rise in temperature, e.g. caused by an exothermic reaction	C04B 40/0082
Processes, in general, for influencing or modifying the properties of mortars, concrete or artificial stone compositions: heating up to sintering temperatures	C04B 40/0268
After-treatment of mortars, concrete, artificial stone or ceramics: Heat treatment	C04B 41/0072
Heat treatments such as] Calcining; Fusing Pyrolysis in general	B01J 6/00 and subgroups

Sintering glass	C03B 19/06 and subgroups
Shaft or like vertical or substantially vertical furnaces wherein no smelting of the charge occurs, e.g. calcining or sintering furnaces	F27B 1/005, F27B 1/005

Special rules of classification

C04B 35/64 generally does not need to be given, since the subgroups of C04B 2235/65 can give more specific information, while C04B 35/64 is very general.

The symbols from the range C04B 2235/65-C04B 2235/668 are used for binder burnout, pre-sintering, sintering, melting, annealing.

C04B 2235/652

Reduction treatment (C04B 2235/664 takes precedence)

Definition statement

This place covers:

The shaped ceramic material is reduced, for instance by using carbon as reducer, or by heating in a reducing atmosphere (e.g. hydrogen, argon, nitrogen, carbon monoxide), e.g. reducing an oxide to a carbide, or reducing a titanate by heating in hydrogen atmosphere.

References

Limiting references

This place does not cover:

Reduction or oxidation treatment of starting mixture or components of the starting mixture used for making ceramics	C04B 35/6265
Reductive annealing of shaped ceramics	C04B 2235/664

Informative references

Attention is drawn to the following places, which may be of interest for search:

coating or impregnating with a product reacting with the substrate, e.g. generating a metal coating by surface reduction of a ceramic substrate	C04B 41/4556
Hydrogen containing atmosphere during thermal treatment of green, sintered or melted ceramic	C04B 2235/6582

C04B 2235/656

characterised by specific heating conditions during heat treatment

Definition statement

This place covers:

The sintering into a shaped ceramic at a certain specific temperature. The temperature at which the heat treatment is performed is of particular importance and is claimed in the claims, or the heating temperature is varied in the examples.

References

Limiting references

This place does not cover:

Heat treatments of starting mixtures for making ceramics, characterised by the treatment temperature	C04B 35/62675
Curing of starting mixtures for making ceramics or of green bodies	C04B 35/6269

Informative references

Attention is drawn to the following places, which may be of interest for search:

Burning methods for clay-wares	C04B 33/32 and subgroups
Binder burnout	C04B 35/638
Burning or sintering processes for ceramics	C04B 35/64 and subgroups
Multi step sintering	C04B 2235/661 and subgroups
Mechanical aspects of sintering clay or ceramic objects	B28B 11/243

C04B 2235/6562

Heating rate

Definition statement

This place covers:

The heating rate of the binder burnout, pre-sinter step, sinter step, melting step, annealing step, is of particular importance, e.g. heating slowly with 1°C/hour or heating fast with 100°C/min.

C04B 2235/6565

Cooling rate

Definition statement

This place covers:

The cooling rate of the binder burnout, pre-sinter step, sinter step, melting step, annealing step, is of particular importance, e.g. cooling slowly with 1°C/hour or cooling fast by direct quenching in water.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cooling of a ceramic, e.g. freezing: In this group the term "cooling" is used in the sense of an additional cooling treatment, different from the traditional cooling step in the fabrication of materials involving a heating step, such as sintering of ceramics	C04B 41/0063
After treatment of ceramics: heat treatment characterised by the subsequent cooling step	C04B 41/0081

Cooling rate after sintering metallic objects	B22F 3/1028

C04B 2235/6567

Treatment time

Definition statement

This place covers:

The treatment time of the binder burnout, pre-sinter step, sinter step, melting step, annealing step, is of particular importance, e.g. heating shortly during only 5 minutes or heating for a long time during for instance 1 day.

C04B 2235/658

Atmosphere during thermal treatment

Definition statement

This place covers:

Using a pressurised atmosphere during binder burnout, pre-sinter step, sinter step, melting step or annealing step, e.g. an atmosphere of 2 bar nitrogen, or if a specific gas is used, such as hydrogen, water, carbon monoxide, carbon dioxide, or if an unexpected atmosphere is used, e.g. heat treating oxide material in nitrogen or argon or heat treating non-oxide material in air.

References

Limiting references

This place does not cover:

Heat treatments of starting mixtures for making ceramics, characterised by the applied pressure of type of atmosphere	C04B 35/6268
Sintering using pressure	C04B 35/645 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

application of coatings on ceramics under inert, e.g. non-oxidising, atmosphere	C04B 41/4517
application of coatings on ceramics under another specific atmosphere	C04B 41/4519
Atmosphere during sintering of metallic articles	B22F 3/1007

C04B 2235/6581

Total pressure below 1 atmosphere, e.g. vacuum

Definition statement

This place covers:

The atmospheric pressure during binder burnout, pre-sinter step, sinter step, melting step or annealing step is reduced to below 1 atmosphere, e.g. to a vacuum, for instance with vacuum sintering, or to facilitate the burning away of the organic binder during binder burnout.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Processes, in general, for influencing or modifying the properties of mortars, concrete or artificial stone compositions: hardening under vacuum or reduced pressure	C04B 40/0272
Processes in general utilising sub-atmospheric pressure; Apparatus therefore	B01J 3/006

C04B 2235/6582

Hydrogen containing atmosphere

Definition statement

This place covers:

The atmosphere during binder burnout, pre-sinter step, sinter step, melting step or annealing step contains hydrogen (H_2) gas, for instance in order to create a reducing atmosphere.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Reduction treatment of the ceramic body during binder burnout, pre-sinter step, sinter step or melting step	C04B 2235/652
Reductive annealing of shaped ceramics	C04B 2235/664

C04B 2235/6583

Oxygen containing atmosphere, e.g. with changing oxygen pressures

Definition statement

This place covers:

The oxygen partial pressure is of particular importance, for instance because it is varied during the heat treatment in order to create a more reducing or a more oxidising atmosphere.

C04B 2235/6584

at an oxygen percentage below that of air

Definition statement

This place covers:

The oxygen percentage is below 20%, i.e. below a partial pressure of 0.2 atmosphere, for instance to create a reducing atmosphere.

C04B 2235/6585

at an oxygen percentage above that of air

Definition statement

This place covers:

The oxygen percentage is above 20%, i.e. above a partial pressure of 0.2 atmosphere, for instance to create an oxidising atmosphere.

C04B 2235/6586

Processes characterised by the flow of gas

Definition statement

This place covers:

The atmosphere during binder burnout, pre-sintering, sintering, melting or annealing is not static. A gas (e.g. nitrogen oxygen, argon) is passed through the heating furnace.

C04B 2235/6587

Influencing the atmosphere by vaporising a solid material, e.g. by using a burying of sacrificial powder

Definition statement

This place covers:

If a ceramic is heated that contains an oxide that can vaporise (e.g. lead or bismuth oxide), the ceramic to be heat treated is surrounded by a powder or other solid of the fugitive oxide, e.g. a lead oxide containing powder. The vaporising of the lead oxide from the sacrificial powder reduces or even prevents the vaporising of the lead oxide of the to-be-sintered ceramic.

C04B 2235/6588

Water vapor containing atmospheres

Definition statement

This place covers:

The atmosphere during binder burnout, pre-sinter step, sinter step, melting step or annealing step contains water vapour.

C04B 2235/66

Specific sintering techniques, e.g. centrifugal sintering

Definition statement

This place covers:

Specific sintering methods not covered by any of the subgroups, such as using enhanced gravity during sintering

Relationships with other classification places

Furnaces, kilns, ovens, or retorts F27

References

Limiting references

This place does not cover:

Heat treatments of non-shaped powders that are used for making ceramics	C04B 35/62645 and subgroups
Curing of starting mixtures for making ceramics or of green bodies	C04B 35/6269
Mechanical aspects of sintering clay or ceramic objects	B28B 11/243
chamber type furnaces	F27B 17/00
Travelling or movable supports or containers for the charge of furnaces, kilns, ovens, retorts in so far as they are of kinds occurring in more than one kind of furnace	F27D 3/12

Informative references

Attention is drawn to the following places, which may be of interest for search:

Burning or sintering processes of clay products	C04B 33/32
Removing organic binders from a shaped green ceramic by burning them out	C04B 35/638
Burning or sintering processes of ceramic or refractory products	C04B 35/64
Making ceramic materials by melting	C04B 35/653 and subgroups
Heat treatments such as] Calcining; Fusing Pyrolysis in general	B01J 6/00 and subgroups
Manufacture of workpieces or articles from metallic powder characterised by the manner of compacting or sintering; Apparatus specially adapted therefore; Presses and furnaces	B22F 3/00 and subgroups
Manufacture of composite layers, workpieces, or articles, comprising metallic powder, by sintering the powder, with or without compacting wherein at least one part is obtained by sintering or compression	B22F 7/00 and subgroups
Sintering glass	C03B 19/06 and subgroups

C04B 2235/661

Multi-step sintering

Definition statement

This place covers:

The sintering (or melting process) consists out of more than one step, after a possible binder burnout step. The process encompasses for instance a pre sintering step and a subsequent pressure sintering step, e.g. a hot isostatic pressing step, or a sintering step and a subsequent annealing step. The process can also be first a melting step and then a sintering step.

References

Limiting references

This place does not cover:

First a binder burnout step and then a sintering step	C04B 35/638

Informative references

Attention is drawn to the following places, which may be of interest for search:

Multiple heating or additional steps during the sintering of metallic articles	B22F 3/1017

C04B 2235/662

Annealing after sintering

Definition statement

This place covers:

After the main sintering step at the highest temperature of the heating process the ceramic is heated at a lower temperature for a prolonged period of time, for instance to reduce the stress in the material.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

After treatment of ceramics: heat treatment	C04B 41/0072
Annealing glass products	C03B 25/00 and subgroups

C04B 2235/663

Oxidative annealing

Definition statement

This place covers:

After the main sintering step at the highest temperature of the heating process the ceramic is heated at a lower temperature for a prolonged period of time, with the effect of oxidising the sintered ceramic.

References

Limiting references

This place does not cover:

Reduction or oxidation treatment of starting mixture or components of the starting mixture used for making ceramics	C04B 35/6265
oxidative annealing for making a coating layer	C04B 41/45 and subgroups
Oxidising the surface of a substrate that is joined with a ceramic substrate before joining	C04B 2237/54

Informative references

Attention is drawn to the following places, which may be of interest for search:

Atmosphere during the heat treatment enriched in oxygen content to above the level normal in air	C04B 2235/6585

C04B 2235/664

Reductive annealing

Definition statement

This place covers:

After the main sintering step at the highest temperature of the heating process the ceramic is heated at a lower temperature for a prolonged period of time, with the effect of reducing the sintered ceramic.

References

Limiting references

This place does not cover:

Reduction or oxidation treatment of starting mixture or components of the starting mixture used for making ceramics	C04B 35/6265
reductive annealing for making a coating layer	C04B 41/45 and subgroups
Reduction treatment of the ceramic body during binder burnout, pre-sinter step, sinter step or melting step	C04B 2235/652

Informative references

Attention is drawn to the following places, which may be of interest for search:

Hydrogen containing atmosphere during thermal treatment of green, sintered or melted ceramic	C04B 2235/6582
Atmosphere during the heat treatment reduced in oxygen content to below the level normal in air	C04B 2235/6584

C04B 2235/665

Local sintering, e.g. laser sintering

Definition statement

This place covers:

A ceramic is not sintered completely at the same moment, first one part is sintered, then possibly another and another and so on, until either the whole ceramic is sintered, or the process is stopped and a part is left unsintered. This can for instance be done with a laser that scans the surface of the sintered, and sinters part by part.

References

Limiting references

This place does not cover:

After treatment of ceramics by laser beam	C04B 41/0036

Informative references

Attention is drawn to the following places, which may be of interest for search:

Selective sintering of metallic powders, i.e. stereolithography	B22F 3/1055

working by laser beam	B23K 26/00 and subgroups
using layers of powder being selectively joined, e.g. by selective laser sintering or melting	B29C 67/0077, B29C 67/0077

C04B 2235/666

Applying a current during sintering, e.g. plasma sintering [SPS], electrical resistance heating or pulse electric current sintering [PECS]

Definition statement

This place covers:

Spark plasma sintering (SPS), also known as field assisted sintering technique (FAST) or pulsed electric current sintering (PECS), is a sintering technique. The main characteristic of SPS is that the pulsed DC current directly passes through the graphite die, as well as the powder compact, in case of conductive samples. Therefore, the heat is generated internally, in contrast to the conventional hot pressing, where the heat is provided by external heating elements. This facilitates a very high heating or cooling rate (up to 1000 K/min), hence the sintering process generally is very fast (within a few minutes). The general speed of the process ensures it has the potential of densifying powders with nanosize or nanostructure while avoiding coarsening which accompanies standard densification routes. Whether plasma is generated has not been confirmed yet, especially when non-conductive ceramic powders are compacted. It has, however, been experimentally verified that densification is enhanced by the use of a current or field.

Electrical Resistance Heating (ERH) is a method that uses the flow of alternating current electricity to the ceramic. Electric current is passed through a targeted ceramic. The resistance to electrical flow that exists in the ceramic causes the formation of heat, resulting in an increase in temperature up to the desired sintering temperature.

References

Limiting references

This place does not cover:

After treatment of ceramics with plasma	C04B 41/0054

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pressing clay at sintering temperatures	C04B 33/326
Pressure sintering to make silicon carbide based ceramics	C04B 35/575
Pressure sintering to make silicon nitride based ceramics	C04B 35/593
Flame, melting or plasma treatment of powders used for making ceramics	C04B 35/62665
Pressing at sintering temperatures of ceramic or refractory mixtures	C04B 35/645 and subgroups
Sintering metallic powder by using electric current other than for infra-red radiant energy, laser radiation or plasma	B22F 3/105
Heating by electric, magnetic, or electromagnetic fields	H05B 6/00 and subgroups

Special rules of classification

SPS is normally performed using pressure, which means it should in theory also be classified in C04B 35/645. This is only done, however, if it is specified which pressure has been used. If the sintering pressure is not specified, only C04B 2235/666 is used.

C04B 2235/667

Sintering using wave energy, e.g. microwave sintering

Definition statement

This place covers:

Heating making use of for instance IR, UV or microwaves.

Dielectric heating, also known as electronic heating, RF heating, high-frequency heating and diathermy, is the process in which a high-frequency alternating electric field, or radio wave or microwave electromagnetic radiation heats a dielectric material. At higher frequencies, this heating is caused by molecular dipole rotation within the dielectric. At lower frequencies in conductive fluids, other mechanisms such as ion-drag are more important in generating thermal energy.

Microwaves are used for heating of various materials in cooking and various industrial processes. The rate of heating of the material depends on the energy absorption, which depends on the dielectric constant of the material. The dependence of dielectric constant on temperature varies for different materials; some materials display significant increase with increasing temperature. This behaviour, when the material gets exposed to microwaves, leads to selective local overheating, as the warmer areas are better able to accept further energy than the colder areas—potentially dangerous especially for thermal insulators, where the heat exchange between the hot spots and the rest of the material is slow. These materials are called thermal runaway materials. This phenomenon occurs in some ceramics.

Electrobeam heating.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Processes, in general, for influencing or modifying the properties of mortars, concrete or artificial stone composition: making use of electric or wave energy or particle radiation	C04B 40/0003 with subgroups
Processes, in general, for influencing or modifying the properties of mortars, concrete or artificial stone compositions: Selection of the hardening environment: making use of electric or wave energy or particle radiation	C04B 40/0204 and subgroups
Melting in electric furnaces by microwave heating	C03B 5/023
Heating by electric, magnetic, or electromagnetic fields: microwave heating	H05B 6/64 and subgroups

C04B 2235/668

Pressureless sintering

Definition statement

This place covers:

If a certain material that normally is sintered using pressure, since otherwise it is difficult to sinter, is sintered without pressure, this code is give. This applies specially to non-oxide materials, such as silicon carbide or silicon nitride. If a document stresses that a material is sintered without pressure, this code can be given.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pressing clay at sintering temperatures	C04B 33/326
Pressure sintering to make silicon carbide based ceramics	C04B 35/575
Pressure sintering to make silicon nitride based ceramics	C04B 35/593
Pressure sintering of ceramics in general	C04B 35/645 and sub-class

C04B 2235/70

Aspects relating to sintered or melt-casted ceramic products

Definition statement

This place covers:

Compositional aspects of the produced ceramic, e.g. the presence of impurities, the crystal structure of the sintered product, the density, the microstructure, the presence of secondary phases.

Shape and size of the ceramic end product and the properties of the ceramic end product.

C04B 2235/72

Products characterised by the absence or the low content of specific components, e.g. alkali metal free alumina ceramics

Definition statement

This place covers:

Materials that have a specified amount of certain impurities or certain undesired phases, materials that are specifically free of certain metal oxides, e.g. titanates or niobates that are lead-free. This code is used for all metal ions that are bound either to oxygen (oxides), carbon (carbides), boron (borides), nitrogen (nitrides) or silicon (silicides). It is also for bound silicon, e.g. low silica, silicon carbide, silicon nitride.

References

Limiting references

This place does not cover:

Eliminating lime or iron from clay mixtures	C04B 33/10

Informative references

Attention is drawn to the following places, which may be of interest for search:

Unintentionally added compounds, such as impurities in raw materials, e.g. alkali sulphates in construction grade cement	C04B 2103/0003
Cement, concrete, mortar or artificial stone mixtures characterised by the absence or the very low content of a specific material	C04B 2111/10 and subgroups
Pure silica glass, e.g. pure fused quartz: impurity concentration specified	C03B 2201/03
Doped silica-based glasses: impurity concentration specified	C03B 2201/07

C04B 2235/721

Carbon content

Definition statement

This place covers:

A ceramic product being free of free carbon (C) or having a low content in free carbon.

References

Limiting references

This place does not cover:

A ceramic product being free of bound carbon or having a low content in bound carbon, e.g. a low content in carbides or carbon nitride.	C04B 2235/72

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cement, concrete, mortar or artificial stone mixtures characterised by the absence or the very low content of a specific material: Carbon free or very low carbon content fly ashes; Fly ashes treated to reduce their carbon content or the effect thereof	C04B 2111/1087 and subgroups

C04B 2235/722

Nitrogen content

Definition statement

This place covers:

A ceramic product being free of undesired nitrogen compounds or having a low content in undesired nitrogen compounds, e.g. a low content in nitrides.

C04B 2235/723

Oxygen content

Definition statement

This place covers:

A ceramic product being free of undesired oxygen compounds or having a low content in undesired oxygen compounds, while possibly containing a desired oxygen compound, for instance a silicon carbide, containing yttria (Y_2O_3) sintering aid, being characterised by the fact that it does not contain any further oxygen than the oxygen present in the yttria.

C04B 2235/724

Halogenide content

Definition statement

This place covers:

A ceramic product characterised by the fact it contains a low amount of undesired halogenide compounds, while possibly containing also one or more desired halogenide compounds, e.g. an alumina ceramic containing less than 1% fluoride.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cement, concrete, mortar or artificial stone mixtures characterised by the absence or the very low content of a specific material: halogen free or very low halogen-content materials	C04B 2111/1062 and subgroups

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

halogenide	fluoride, chloride, bromide, iodide

C04B 2235/725

Metal content

Definition statement

This place covers:

A ceramic being characterised by the fact that it contains a low amount or even no metal phase, e.g. a sintered diamond compact that is free of cobalt metal, or a sintered tungsten carbide compact being free of nickel binder.

References

Limiting references

This place does not cover:

A ceramic being characterised by the fact that it contains a low amount of metal oxide, metal carbide, metal nitride, metal boride or metal silicide.	C04B 2235/72

C04B 2235/726

Sulfur content

Definition statement

This place covers:

A ceramic containing a low amount of sulphur compounds or low amount of elemental sulphur, e.g. less than 1% sulphate (SO_4^{2-}), sulphite (SO_3^{2-}), sulphide (S^{2-})

C04B 2235/727

Phosphorus or phosphorus compound content

Definition statement

This place covers:

A ceramic containing a low amount of phosphor compounds or low amount of elemental phosphor, e.g. less than 1% phosphate, phosphide, phosphor

C04B 2235/728

Silicon content

Definition statement

This place covers:

Ceramics having a low content in unbound silicon, e.g. a silicon carbide made by reaction sintering of carbon and silicon, containing less than 1% residual unreacted silicon.

References

Limiting references

This place does not cover:

A ceramic having a low silica (SiO2) content	C04B 2235/72

C04B 2235/74

Physical characteristics

Definition statement

This place covers:

Characteristics such as the crystal structure, density, microstructure of the sintered product.

C04B 2235/75

Products with a concentration gradient

Definition statement

This place covers:

Ceramics products that have a gradient in the composition of the product of at least one of the components, for instance an alumina-zirconia ceramic that on one side has 20% alumina and 80%

zirconia, and on the other side of the product 80% alumina and 20% zirconia, while in between there is a gradient from one side to the other.

References

Limiting references

This place does not cover:

Ceramics products with a gradient in the density	C04B 2235/775
Ceramic products with a gradient in the composition, where this gradient results from joining ceramic layers that have different compositions	C04B 2237/58 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cement, concrete, mortar or artificial stone mixtures with a gradually increasing or decreasing concentration of ingredients or property from one layer to another	C04B 2111/00405

C04B 2235/76

Crystal structural characteristics, e.g. symmetry

Definition statement

This place covers:

The ceramic product having a specific lattice system, e.g. triclinic, monoclinic, orthorombic or rhomohedral, or a specific crystal system such as trigonal (see below for the relation between lattice system and crystal system), or a specific crystal structure, e.g. perovskite, garnet, spinel

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Three-dimensional structures of inorganic powders	C01P 2002/20

Special rules of classification

The relation between three-dimensional crystal families, crystal systems, and lattice systems is shown in the following table:

Crystal family	Crystal system	Required symmetries of point group	point groups	space groups	bravais lattices	Lattice system
Triclinic		None	2	2	1	Triclinic
Monoclinic		1 twofold axis of rotation or 1 mirror plane	3	13	2	Monoclinic
Orthorhombic		3 twofold axes of rotation or 1 twofold axis of rotation and two mirror planes.	3	59	4	Orthorhombic
Tetragonal		1 fourfold axis of rotation	7	68	2	Tetragonal
Hexagonal	Trigonal	1 threefold axis of rotation	5	7	1	Rhombohedral
				18	1	Hexagonal
	Hexagonal	1 sixfold axis of rotation	7	27		
Cubic		4 threefold axes of rotation	5	36	3	Cubic
Total: 6						

C04B 2235/761

Unit-cell parameters, e.g. lattice constants

Definition statement

This place covers:

At least one of the lattice constants of the ceramic material is defined. The lattice constant [or lattice parameter] refers to the constant distance between unit cells in a crystal lattice. Lattices in three dimensions generally have three lattice constants, referred to as a, b, and c. However, in the special case of cubic crystal structures, all of the constants are equal and we only refer to a. Similarly, in hexagonal crystal structures, the a and b constants are equal, and we only refer to the a and c constants. A group of lattice constants could be referred to as lattice parameters. However, the full set of lattice parameters consist of the three lattice constants and the three angles between them.

For example the lattice constant for a common carbon diamond is a = 3.57Å at 300 K. The structure is equilateral although its actual shape cannot be determined from only the lattice constant. Furthermore, in real applications, typically the average lattice constant is given. As lattice constants have the dimension of length, their SI unit is the meter. Lattice constants are typically on the order of several angstroms (i.e. tenths of a nanometre). Lattice constants can be determined using techniques such as X-ray diffraction or with an atomic force microscope.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Inorganic powders defined by unit-cell parameters, atom positions or structure diagrams	C01P 2002/77
Semiconductor bodies characterised by their crystalline structure, e.g. polycrystalline, cubic, particular orientation of crystalline planes	H01L 29/04, H01L 29/04 and subgroups

C04B 2235/762

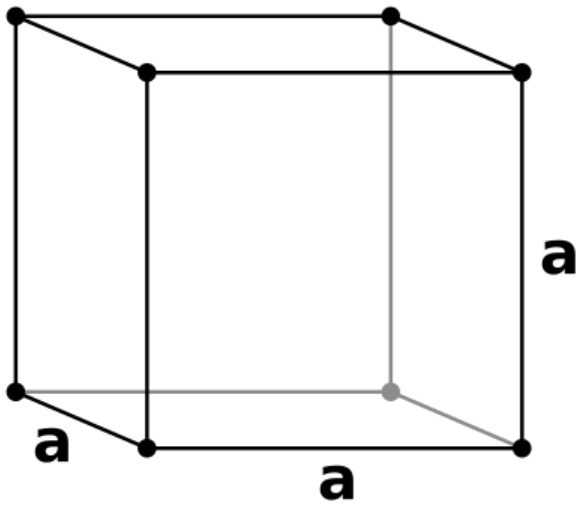
Cubic symmetry, e.g. beta-SiC

Definition statement

This place covers:

Ceramics having a cubic lattice or crystal system. In crystallography, the cubic (or isometric) crystal system is a crystal system where the unit cell is in the shape of a cube. This is one of the most common and simplest shapes found in crystals and minerals.

There are three main varieties of these crystals, called simple cubic (sc), body-centered cubic (bcc), and face-centered cubic (fcc, also known as cubic close-packed or ccp), plus a number of other variants listed below. Note that although the unit cell in these crystals is conventionally taken to be a cube, the primitive unit cell often is not. This is related to the fact that in most cubic crystal systems, there is more than one atom per cubic unit cell.



References

Limiting references

This place does not cover:

Cubic boron nitride ceramics	C04B 35/5831

Special rules of classification

The symbol only needs to be given if it is not standard that the material is cubic, e.g. perovskites can be either cubic, tetragonal or orthorombic, therefore it is not standard that the perovskite is cubic.

If a ceramic material has beta-SiC as the main phase, C04B 2235/762 is given to indicate that the silicon carbide is in the beta form.

C04B 2235/763

Spinel structure AB_2O_4

Definition statement

This place covers:

The spinels are any of a class of minerals of general formulation $A^{2+}B_2{}^{3+}O_4{}^{2-}$ which crystallise in the cubic (isometric) crystal system, with the oxide anions arranged in a cubic close-packed lattice and the cations A and B occupying some or all of the octahedral and tetrahedral sites in the lattice. A and B can be divalent, trivalent, or quadrivalent cations, including magnesium, zinc, iron, manganese, aluminium, chromium, titanium, and silicon. Although the anion is normally oxide, the analogous thiospinel structure includes the rest of the chalcogenides. A and B can also be the same metal under different charges, such as the case in Fe_3O_4 (as $Fe^{2+}Fe_2{}^{3+}O_4{}^{2-}$). The main groups of spinels are aluminate spinels, ferrite spinels and chromite spinels.

References

Limiting references

This place does not cover:

Magnesium aluminate spinel ceramics	C04B 35/443

Informative references

Attention is drawn to the following places, which may be of interest for search:

Magnesium aluminate spinel ceramics	C04B 35/443
Coating or impregnating ceramic substrates with spinels	C04B 41/5046
Spinel catalysts	B01J 21/005, B01J 21/005, C07C 2521/00/, B01J 23/005, B01J 23/005, B01D 2255/405
Oxide powders with spinel symmetry	C01P 2002/32
Single crystals of complex oxides with formula BMe2O4, wherein B is Mg, Ni, Co, Al, Zn, or Cd and Me is Fe, Ga, Sc, Cr, Co, or Al	C30B 29/26

Special rules of classification

If the class C04B 35/443 is given, C04B 2235/763 does not need to be given.

C04B 2235/764

Garnet structure $A_3B_2(CO_4)_3$

Definition statement

This place covers:

The crystallographic structure of garnets has been expanded from the silicon containing prototype to include chemicals with the general formula $A_3B_2(CO_4)_3$. Besides silicon, a large number of elements have been put on the C site, including Ge, Ga, Al, V and Fe. Yttrium aluminium garnet (YAG), $Y_3Al_2(AlO_4)_3$, is used for synthetic gemstones. When doped with neodymium (Nd^{3+}), these YAl-garnets may be used as the lasing medium in lasers. In yttrium iron garnet (YIG), $Y_3Fe_2(FeO_4)_3$, the five iron(III) ions occupy two octahedral and three tetrahedral sites, with the yttrium(III) ions coordinated by eight oxygen ions in an irregular cube. The iron ions in the two coordination sites exhibit different spins, resulting in magnetic behaviour. YIG is a ferrimagnetic material having a Curie temperature of 550 K. All garnets have cubic symmetry.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Other ferrites containing rare earth metals, e.g. rare earth ferrite garnets	C04B 35/2675
Single crystals of complex oxides with formula A3Me5O12 wherein A is a rare earth metal and Me is Fe, Ga, Sc, Cr, Co or Al, e.g. garnets	C30B 29/28
Soft magnetic material, e.g. ferrite garnets	H01F 1/346, H01F 1/346
Thin magnetic films, e.g. of one-domain structure made of garnet ferrites	H01F 10/24, H01F 10/24 and subgroups

C04B 2235/765

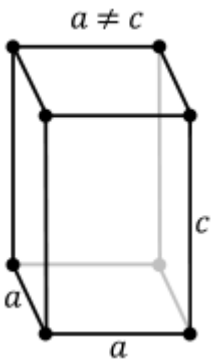
Tetragonal symmetry

Definition statement

This place covers:

Ceramics having a cubic lattice or crystal system. In crystallography, the tetragonal crystal system is one of the 7 lattice point groups. Tetragonal crystal lattices result from stretching a cubic lattice along one of its lattice vectors, so that the cube becomes a rectangular prism with a square base (a by a) and height (c, which is different from a).

There are two tetragonal Bravais lattices: the simple tetragonal (from stretching the simple-cubic lattice) and the centered tetragonal (from stretching either the face-centered or the body-centered cubic lattice).



Special rules of classification

The code only needs to be given if it is not standard that the material is tetragonal, e.g. perovskites can be either cubic, tetragonal or orthorombic, therefore it is not standard that the perovskite is tetragonal.

C04B 2235/766

Trigonal symmetry, e.g. alpha-Si_3N_4 or alpha-Sialon

Definition statement

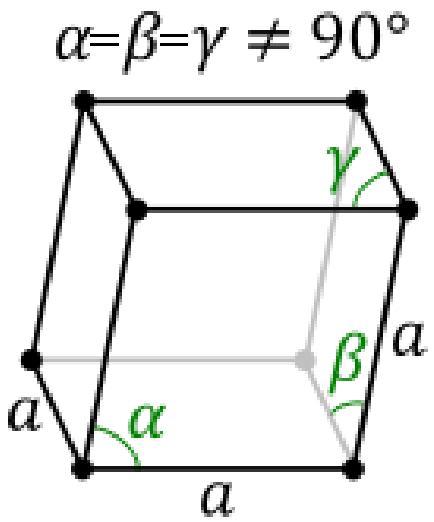
This place covers:

Ceramics having a trigonal crystal system. In crystallography, the trigonal crystal system is one of the seven crystal systems, and the rhombohedral lattice system is one of the seven lattice systems. They are often confused with each other: crystals in the rhombohedral lattice system are always in the trigonal crystal system, but some crystals such as quartz are in the trigonal crystal system but not in the rhombohedral lattice system. The rhombohedral lattice system consists of the rhombohedral lattice, while the trigonal crystal system consists of the five point groups of the seven space groups with a rhombohedral lattice. There are 25 space groups whose point groups are one of the five in the trigonal crystal system, consisting of the seven space groups associated with the rhombohedral lattice system together with 18 of the 45 space groups associated with the hexagonal lattice system.

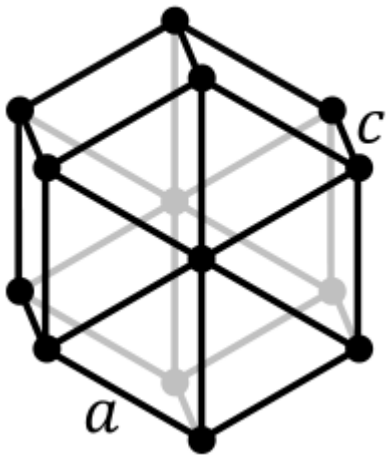
The trigonal crystal system is the only crystal system whose point groups have more than one lattice system associated with their space groups: the hexagonal and rhombohedral lattices both appear.

Unit cells for trigonal crystal system:

Rhombohedral



Hexagonal



Special rules of classification

If a ceramic material has alpha silicon nitride or alpha sialon as the main phase, C04B 2235/766 is given to indicate that the silicon nitride or sialon is in the alpha form.

C04B 2235/767

Hexagonal symmetry, e.g. beta-Si_3N_4, beta-Sialon, alpha-SiC or hexa-ferrites

Definition statement

This place covers:

Ceramics having a tetragonal lattice or crystal system. In crystallography, the hexagonal crystal system is one of the 7 crystal systems, the hexagonal lattice system is one of the 7 lattice systems, and the hexagonal crystal family is one of the 6 crystal families. They are closely related and often confused with each other, but they are not the same. The hexagonal lattice system consists of just one Bravais lattice type: the hexagonal one. The hexagonal crystal system consists of the 7 point groups such that all their space groups have the hexagonal lattice as underlying lattice. The hexagonal crystal family consists of the 12 point groups such that at least one of their space groups has the hexagonal

lattice as underlying lattice, and is the union of the hexagonal crystal system and the trigonal crystal system. Graphite is an example of a crystal that crystallizes in the hexagonal crystal system.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Soft magnetic material, e.g. Hexaferrites with decreased hardness or anisotropy, i.e. with increased permeability in the microwave (GHz) range	H01F 1/348, H01F 1/348
Thin magnetic films, e.g. of one-domain structure made of hexagonal ferrites	H01F 10/205, H01F 10/205
LaMgAl11O19 (LNA, Lanthanum Magnesium Hexaluminate) used for lasers	H01S 3/1635

Special rules of classification

If a ceramic material has alpha SiC, beta silicon nitride or beta sialon as the main phase, C04B 2235/767 is given to indicate that the silicon nitride or sialon is in the beta form, or the silicon carbide is in the alpha form.

C04B 2235/768

Perovskite structure ABO_3

Definition statement

This place covers:

A perovskite structure is any material with the same type of crystal structure as calcium titanium oxide (CaTiO3), known as the perovskite structure, or XIIA2+VIB4+X2−3 with the oxygen in the face centers. The general chemical formula for perovskite compounds is ABX3, where 'A' and 'B' are two cations of very different sizes, and X is an anion that bonds to both. The 'A' atoms are larger than the 'B' atoms. The ideal cubic-symmetry structure has the B cation in 6-fold coordination, surrounded by an octahedron of anions, and the A cation in 12-fold cuboctahedral coordination. The perovskite structure is adopted by many oxides that have the chemical formula ABO3. The perovskite can be either cubic, orthorombic or tetragonal.

References

Limiting references

This place does not cover:

Ceramics based on barium titanate perovskite	C04B 35/4682 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Catalysts comprising metals or metal oxides or hydroxides: Mixed oxides other than spinels, e.g. perovskite	B01J 23/002
Oxide powders with perovskite symmetry	C01P 2002/36
Single crystals of complex oxides with formula AMeO3, wherein A is a rare earth metal and Me is Fe, Ga, Sc, Cr, Co or Al, e.g. orthoferrites	C30B 29/24

Special rules of classification

If the presence of a perovskite structure is inherent due to the class that is given, this symbol does not need to be given. This is the case with C04B 35/4682 and C04B 35/4684, barium titanate perovskites.

If the perovskite is cubic or tetragonal, C04B 2235/762 or C04B 2235/765 are given, respectively. If the perovskite is orthorombic, C04B 2235/76 is given.

C04B 2235/77

Density

Definition statement

This place covers:

The density of the pre-sintered, sintered or melted ceramic is indicated, either as the theoretical density, e.g. 99% dense, or as the absolute density, e.g. 5.0 g/cm3.

References

Limiting references

This place does not cover:

Ceramics characterised by the porosity	C04B 38/0067
Density of green ceramic	C04B 2235/608

Informative references

Attention is drawn to the following places, which may be of interest for search:

Density of cement, concrete, mortar or artificial stone	C04B 2201/20
Solid density of inorganic powders per se	C01P 2006/10

C04B 2235/775

Products showing a density-gradient

Definition statement

This place covers:

The ceramic product has a gradient in the theoretical density, one side has a higher density than the other, e.g. one side is 95% dense, the other side 90%.

References

Limiting references

This place does not cover:

Ceramics products with a gradient in the composition	C04B 2235/75
Forming a gradient in composition or in properties across the laminate or the joined articles by joining layers or articles of the same composition but having different densities	C04B 2237/58 and subgroups

Special rules of classification

If a ceramic has a gradient in the composition, it automatically will have a gradient in the absolute density as well, unless the two different phases have the same specific density, which will be rarely the case. The gradient therefore has to be in the theoretical density, since the theoretical density does not depend on the composition.

C04B 2235/78

Grain sizes and shapes, product microstructures, e.g. acicular grains, equiaxed grains, platelet-structures

Definition statement

This place covers:

The sintered (or melted) ceramic has a specific microstructure, a certain grain, certain grain shapes, etc.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Constituents or additives for ceramic mixtures characterised by their shapes	C04B 2235/52 and subgroups

Special rules of classification

The symbol C04B 2235/78 is given if the grain size is higher than 100 microns and if the microstructure is being shown, e.g. in SEM pictures or TEM pictures.

C04B 2235/781

Nanograined materials, i.e. having grain sizes below 100 nm

Definition statement

This place covers:

The average grain size of the sintered (or melted) ceramic is below 100 nanometers.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Particles or aggregates of a component of the ceramic starting mixture have an average particle size of below 100 nanometers	C04B 2235/5454

C04B 2235/782

Grain size distributions

Definition statement

This place covers:

Information is give on how the grain size is distributed. This relates to particles of the same type only. It is mentioned how many grains of different size ranges for the same type of grain are present.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Particle size distribution of an individual component (of the same material) of the starting mixture for making a ceramic	C04B 2235/5463

C04B 2235/783

Bimodal, multi-modal or multi-fractional

Definition statement

This place covers:

The grains of the sintered (or melted) ceramic do not have a uniform grain size distribution, there is at least one type of grains with a smaller size and one type of grains with a larger size.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Clay powders consisting of a mixture of materials with different sizes, e.g. multi-fraction powder	C04B 33/025
Particle size distribution of an individual component (of the same material) of the starting mixture for making a ceramic being bimodal, multi-modal or multi-fraction	C04B 2235/5472

C04B 2235/784

Monomodal

Definition statement

This place covers:

The grains of the sintered (or melted) ceramic have a uniform grain size distribution, at least as so far the grains belong to the same phase.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Particle size distribution of an individual component (of the same material) of the starting mixture for making a ceramic being monomodal.	C04B 2235/5481

C04B 2235/785

Submicron sized grains, i.e. from 0,1 to 1 micron

Definition statement

This place covers:

The average grain size of the sintered (or melted) ceramic is in the range of 0.1-1 microns.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Particles or aggregates of a component of the ceramic starting mixture have an average particle size of 0.1-1 micron	C04B 2235/5445

C04B 2235/786

Micrometer sized grains, i.e. from 1 to 100 micron

Definition statement

This place covers:

The average grain size of the sintered (or melted) ceramic is in the range of 1-100 microns.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on magnesia, the ceramic having a grain size below 100 microns (fine ceramic)	C04B 35/053
Ceramics based on alumina, the ceramic having a grain size below 100 microns (fine ceramic)	C04B 35/111 and subgroups
Ceramics based on zirconia, the ceramic having a grain size below 100 microns (fine ceramic)	C04B 35/486 and subgroups
Ceramics based on silicon nitride, the ceramic having a grain size below 100 microns (fine ceramic)	C04B 35/587
Particles or aggregates of a component of the ceramic starting mixture have an average particle size of 1-100 micron	C04B 2235/5436

C04B 2235/787

Oriented grains

Definition statement

This place covers:

The grains of the sintered (or melted) ceramic are to a certain extent aligned along a certain axis, e.g. it has elongated grains that are aligned in a certain direction, or it has grains whose magnetic moment has been aligned. This is often the case for dielectric or piezoelectric films.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cement, concrete, mortar or artificial stone mixtures containing oriented fillers or elements	C04B 2111/0037

C04B 2235/788

Aspect ratio of the grains

Definition statement

This place covers:

The grains are elongated and the average width divided by the average length has been measured. The aspect ratio of spherical grains can also be mentioned.

C04B 2235/79

Non-stoichiometric products, e.g. perovskites (ABO_3) with an A/B-ratio other than 1

Definition statement

This place covers:

Materials having a stoichiometry that deviates from what is normal for that specific material, e.g. bismuth sodium titanate normally is (Bi0.5Na0.5)TiO3, (Bi0.48Na0.52)TiO3 therefore has a deviating stoichiometry.

References

Limiting references

This place does not cover:

The use of sub-stoichiometric titanium oxides for making ceramics	C04B 2235/3237
The use of sub-stoichiometric niobium oxides for making ceramics	C04B 2235/3253
Sintered ferrites that contain ferrous iron, iron with an oxidation state of +2.	C04B 2235/83

C04B 2235/80

Phases present in the sintered or melt-cast ceramic products other than the main phase

Definition statement

This place covers:

All sintered ceramics that contain at least one secondary phase, where this secondary phase is not a grain boundary phase, e.g. a titanate ceramic containing a secondary niobate phase, or a silicate ceramic containing a main silicate phase and a secondary silicate phase.

References

Limiting references

This place does not cover:

Reinforced clay wares	C04B 33/36
Magnesia based refractories from grain sized mixtures containing refractory metal compounds other than chromium oxide or chrome ore	C04B 35/0435
Magnesia based refractories from grain sized mixtures containing chromium oxide or chrome ore	C04B 35/047 and subgroups
Magnesia based refractories obtained by fusion casting containing chromium oxide or chrome ore	C04B 35/051
Alumina based refractories from grain sized mixtures containing refractory metal compounds other than those covered by C04B 35/103 - C04B 35/106	C04B 35/1015
Alumina based refractories from grain sized mixtures containing non-oxide refractory materials, e.g. carbon	C04B 35/103
Alumina based refractories from grain sized mixtures containing chromium oxide or chrome ore	C04B 35/105 and subgroups
Alumina based refractories containing zirconia	C04B 35/106
Alumina refractories containing zirconia, made by melt-casting	C04B 35/109
fine alumina ceramics containing one or more secondary phases	C04B 35/117 and subgroups
Zirconia-based ceramics containing one or more secondary phases	C04B 35/488 and subgroups
Ceramic products containing macroscopic reinforcing agents, e.g. fibers	C04B 35/71 and subgroups
Ceramics where the secondary phase is a continuous glass phase	C03C 10/00 and subgroups
Ceramics where the secondary phase is a continuous metallic phase	C22C 29/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics containing a grain boundary phase	C04B 2235/85

Special rules of classification

The symbol C04B 2235/80 is not used for the above-mentioned classes, where by default a different secondary phase has to be present.

All secondary phases are indicated with symbols from the scheme C04B 2235/32-C04B 2235/428.

C04B 2235/81

Materials characterised by the absence of phases other than the main phase, i.e. single phase materials

Definition statement

This place covers:

Sintered ceramics that, with the exception of a grain boundary phase, contain only one phase, e.g. single phase barium titanate or single phase translucent alumina.

C04B 2235/83

Ferrites containing Fe2+

Definition statement

This place covers:

Sintered ferrites that contain ferrous iron, iron with an oxidation state of +2.

C04B 2235/85

Intergranular or grain boundary phases

Definition statement

This place covers:

The sintered ceramic contains an intergranular or grain boundary phase, e.g. glassy grain pockets or an amorphous phase along the grain boundaries. The brain boundary phase can also be crystalline.

C04B 2235/87

Grain boundary phases intentionally being absent

Definition statement

This place covers:

It is specifically mentioned or it is clear from SEM- or TEM-pictures that the sintered ceramic does not contain grain boundary phases. The ceramic can contain secondary phases, though, by no means it has to be single phase.

C04B 2235/94

Products characterised by their shape

Definition statement

This place covers:

The sintered ceramic has a specific shape, e.g. is a disc, tube, hollow core, radome, etc.

Relationships with other classification places

working by grinding or polishing B24

shaping of ceramics B28B

Working stone or stone-like materials, e.g. brick, concrete or glass , not provided for elsewhere; machines, devices, tools therefore B28D

References

Limiting references

This place does not cover:

Free standing ceramic films or tapes	C04B 35/62218, C04B 2235/6025
Ceramic coating	C04B 35/62222, C04B 41/00 and subgroups
Ceramic fibers	C04B 35/62227 and subgroups, C04B 2235/5216 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Slip casting of clay wares	C04B 33/28
making the green bodies or pre-forms by moulding	C04B 2235/602 and subgroups
pressing at non-sintering temperatures to make green bodies or pre-forms	C04B 2235/604 and subgroups
Forming ceramic laminates or joined ceramic articles comprising at least one member in the form other than a sheet or disc, e.g. two tubes or a tube and a sheet or disc	C04B 2237/76 and subgroups

C04B 2235/945

Products containing grooves, cuts, recesses or protusions

Definition statement

This place covers:

The shaped sintered ceramic containing macro-sized unevenness at the surface

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Forming ceramic laminates or joined ceramic articles comprising grooves or cuts	C04B 2237/64
Apparatus or processes for reshaping the surface of ceramic objects, e.g. smoothing, roughening, corrugating, making screw-threads	B28B 11/08 and subgroups

Methods or apparatus for grooving or corrugating ceramic tubes	B28B 21/965

C04B 2235/95

Products characterised by their size, e.g. microceramics

Definition statement

This place covers:

ceramics of which the size is specified, the ceramic being either unusually large or unusually small, or just one dimension having a specific size, e.g. the ceramic being very long

C04B 2235/96

Properties of ceramic products, e.g. mechanical properties such as strength, toughness, wear resistance

Definition statement

This place covers:

Ceramic products having specific mechanical properties, such as hardness, toughness, strength, wear resistance, elasticity

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Strengthening clay wares through the addition of reinforcing additives	C04B 33/36
Strengthening ceramics through the addition of reinforcing additives	C04B 35/71 and subgroups
Properties and uses of cement, concrete, mortar or artificial stone	C04B 2111/00 and subgroups
Cement, concrete, mortar or artificial stone characterised by specific physical values for the mechanical strength	C04B 2201/50 and subgroups
Mechanical properties of the green compact	C04B 2235/608
Mechanical properties of membranes, e.g. strength	B01D 2325/24
Mechanical properties of the layers of laminates	B32B 2307/50 and subgroups
Mechanical properties of carbon nanotubes	C01B 2202/26

Special rules of classification

The symbol C04B 2235/96 is used only to indicate the mechanical properties of ceramics, the symbols of the subgroups of C04B 2235/96 are for other properties. Electrical properties are not coded in C04B 2235/96 and subgroups, as these are normally indicated by the relevant CPC symbols from the H-part of the ECLA-scheme, e.g. the piezoelectric properties are indicated by the classification in H01L 41/00 and subgroups, dielectric properties are indicated for instance by a class from H01G 4/12 and subgroups, semiconducting properties are indicated by a class from H01L 23/00 and subgroups, etc.

C04B 2235/9607

Thermal properties, e.g. thermal expansion coefficient

Definition statement

This place covers:

Properties such as the thermal expansion coefficient, thermal conductivity, melting point, heat capacity, thermal shock resistance

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cement, concrete, mortar or artificial stone characterised by specific physical values for heat transfer properties such as thermal insulation values, e.g. R-values	C04B 2201/30 and subgroups

C04B 2235/9615

Linear firing shrinkage

Definition statement

This place covers:

The shrinkage of the green body or pre-sintered body during sintering, normally indicated in percentage, e.g. a linear firing shrinkage of -20%, meaning that the ceramic shrinks 20% during sintering

Relationships with other classification places

Furnaces, kilns, ovens, or retorts F27

References

Limiting references

This place does not cover:

Shrinkage during curing	C04B 35/6269
Shrinkage during drying of green compact	C04B 2235/606

Informative references

Attention is drawn to the following places, which may be of interest for search:

Burning methods for clay-wares	C04B 33/32 and subgroups
Sintering of ceramics	C04B 35/64 and subgroups
Aspects relating to heat treatment of ceramic bodies such as green ceramics or pre-sintered ceramics, e.g. burning, sintering or melting processes	C04B 2235/65 and subgroups
Mechanical aspects of sintering clay or ceramic objects	B28B 11/243

C04B 2235/9623

Ceramic setters properties

Definition statement

This place covers:

The use of substrates, supports, jigs during heating steps, mainly the sintering step, that have the function of giving mechanical support to the ceramic that is being sintered.

Relationships with other classification places

Furnaces, kilns, ovens, or retorts F27

References

Limiting references

This place does not cover:

Using sacrificial powder or objects to influence the atmosphere during a heating step	C04B 2235/6587
Using constraining layers before or during sintering of ceramic laminates or ceramic substrates that are joined with other substrates	C04B 2237/56 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Burning methods for clay-wares	C04B 33/32 and subgroups
Sintering of ceramics	C04B 35/64 and subgroups
Aspects relating to heat treatment of ceramic bodies such as green ceramics or pre-sintered ceramics, e.g. burning, sintering or melting processes	C04B 2235/65 and subgroups
Mechanical aspects of sintering clay or ceramic objects	B28B 11/243

C04B 2235/963

Surface properties, e.g. surface roughness

Definition statement

This place covers:

Properties that are surface related, e.g. the surface roughness

References

Limiting references

This place does not cover:

Applying of coatings to the surface of a ceramic	C04B 41/00 and subgroups
Oxidising the surface of a ceramic as preparation for joining the ceramic	C04B 2237/54

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pre-treatment of the joining surfaces of a substrate that is joined with a ceramic substrate, e.g. cleaning, machining	C04B 2237/52 and subgroups
Apparatus or processes for smoothing the surface of ceramic objects	B28B 11/0845
Methods or apparatus for smoothing, roughening, corrugating or for removing burr from ceramic tubes	B28B 21/96

C04B 2235/9638

Tolerance; Dimensional accuracy

Definition statement

This place covers:

An individual ceramic that is defined by having very accurate dimensions, or a series of ceramic objects that have all the same dimensions within a certain narrow range (the tolerance).

References

Limiting references

This place does not cover:

Forming ceramic laminates or joined ceramic articles showing high dimensional accuracy, e.g. indicated by the warpage	C04B 2237/64

C04B 2235/9646

Optical properties

Definition statement

This place covers:

Properties such as IR or UV absorption, light scattering or reflection

References

Limiting references

This place does not cover:

Luminescent, e.g. electroluminescent, chemiluminescent materials	C09K 11/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cement, concrete, mortar or artificial stone mixtures characterised by the optical properties, e.g. transparency or reflexibility	C04B 2111/80 and subgroups
Optical properties of inorganic powders per se	C01P 2006/60 and subgroups

C04B 2235/9653

Translucent or transparant ceramics other than alumina

Definition statement

This place covers:

Transparent or translucent ceramics, such as aluminate (YAG or spinel), AlON, zirconia, yttria

References

Limiting references

This place does not cover:

Transparent or translucent alumina ceramics	C04B 35/115

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cement, concrete, mortar or artificial stone mixtures characterised by the transparency	C04B 2111/805

C04B 2235/9661

Colour

Definition statement

This place covers:

All ceramic materials that are defined by their colour, including black and white, or whose colour is influenced by the addition of colouring additives

References

Limiting references

This place does not cover:

Coloured clay ceramics	C04B 33/14

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cement, concrete, mortar or artificial stone mixtures characterised by a white colour	C04B 2111/802
Cement, concrete, mortar or artificial stone mixtures characterised by the colour	C04B 2111/82

C04B 2235/9669

Resistance against chemicals, e.g. against molten glass or molten salts

Definition statement

This place covers:

The chemical resistance of ceramics against oxidation, reduction, reaction.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cement, concrete, mortar or artificial stone mixtures characterised by the resistance against chemical, physical or biological attack	C04B 2111/20 and subgroups

C04B 2235/9676

against molten metals such as steel or aluminium

Definition statement

This place covers:

The resistance of ceramic materials, e.g. refractory linings used in converters, ladles, tundishes, etc., against molten metals such as steel, aluminium

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Hot tops from refractory material for ingot moulds	B22D 7/102
Linings for casting melt-holding vessels, e.g. ladles, tundishes, cups or the like	B22D 41/02 and subgroups
Blast furnaces with special refractories, e.g. linings	C21B 7/04 and subgroups
Refractory linings for carbon-steel converters	C21C 5/44, C21C 5/44 and subgroups
Refractory coated lances; Immersion lances for carbon-steel converters	C21C 5/4613, C21C 5/4613

C04B 2235/9684

Oxidation resistance

Definition statement

This place covers:

The resistance against oxidation, e.g. when heating non-oxides such as silicon carbide in an oxygen containing atmosphere

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Directional oxidation or solidification, e.g. Lanxide process	C04B 35/652
oxidative annealing for making a coating layer	C04B 41/45 and subgroups
Atmosphere during the heat treatment enriched in oxygen content to above the level normal in air	C04B 2235/6585
Oxidative annealing of shaped ceramics	C04B 2235/663
Oxidising the surface of a substrate that is joined with a ceramic substrate before joining	C04B 2237/54

C04B 2235/9692

Acid, alkali or halogen resistance

Definition statement

This place covers:

The resistance against alkalis such as cryolite, molten glass

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Resistance against alkali-aggregate reaction of mortars, concrete or artificial stone	C04B 2111/2023
Acid resistance, e.g. against acid air or rain of mortars, concrete or artificial stone	C04B 2111/23

C04B 2237/00

Aspects relating to ceramic laminates or to joining of ceramic articles with other articles by heating

Definition statement

This place covers:

Secondary aspects of making ceramic laminates (B32B 18/00) and of joining ceramic articles with other articles through heating (C04B 37/00 and sub-classes), e.g. the composition of the layers or articles that are laminated or joined, the composition of the interlayers that are used for joining, processing aspects such as surface treatments to the layers-to-be-joined and also the geometrical configuration of the articles that are joined, e.g. joining both layers on their small side or one layer on the largest surface with one layer on the shortest surface.

Relationships with other classification places

Soldering or unsoldering; welding; cladding or plating by soldering or welding; cutting by applying heat locally e.g. flame cutting; working by laser beam B23K

Coatings applied to the outside of the metallic substrate, thus the side of the substrate that is not bonded with another substrate C23C

joining constructional elements in general F16B

References

Limiting references

This place does not cover:

Layered products essentially comprising metal	B32B 15/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Clay-wares	C04B 33/00 and subgroups
Ceramic materials	C04B 35/00 and subgroups
joining of a ceramic layer to another layer	C04B 37/00 and subgroups
porous ceramic products	C04B 38/00
Honeycomb structures assembled from subunits	C04B 38/0016
Aspects relating to ceramic starting mixtures or sintered ceramic products	C04B 2235/00 and s subgroups
Application of procedures in order to connect objects or parts, e.g. coating with sheet metal otherwise than by plating	B21D 39/00 and subgroups
Friction heat forging	B21J 5/063
Riveting	B21J 15/00 and subgroups
Uniting components to form integral members, e.g. turbine wheels and shafts, caulks with inserts, with or without shaping of the components	B21K 25/00 and subgroups
Connecting metal parts or objects by metal-working techniques, not covered wholly by either B21J or B23K	B23P 11/00 and subgroups
Joining or sealing of preformed parts, e.g. welding of plastics materials; Apparatus therefore	B29C 65/00 and subgroups
Layered products essentially comprising ceramics , e.g. refractory products	B32B 18/00
Uniting glass pieces by fusing without substantial reshaping	C03B 23/20
Joining pieces of glass to pieces of other inorganic material; Joining glass to glass other than by fusing	C03C 27/00 and subgroups
Connecting constructional elements or machine parts by sticking or pressing them together, e.g. cold pressure welding	F16B 11/00 and subgroups
Seals between parts of vessels of electric discharge tubes or discharge lamps	H01J 5/20

C04B 2237/02

Aspects relating to interlayers, e.g. used to join ceramic articles with other articles by heating

Definition statement

This place covers:

An interlayer is a layer that is applied in-situ on a substrate, e.g. by a coating a substrate, or by laying a sheet or foil upon a substrate, or by chemically treating the surface of a substrate to such an extent that a separate layer is formed at the surface, e.g. by oxidising a metal or non-oxide substrate. The function of the interlayer has to be to bond two layers or two objects to each other. Any coating that is applied on a substrate at the side of the substrate that is bonded is regarded as interlayer and is indicated with a symbol from the range C04B 2237/02-C04B 2237/16. Any material that is not classified in any of the sub-classes is classified in this class, such as boron interlayers.

References

Limiting references

This place does not cover:

Coatings applied to the outside of the ceramic substrate, thus the side of the substrate that is not bonded with another substrate	C04B 41/00 and subgroups
Interlayers between two metallic substrates, two glass substrates or between a glass and metallic substrate	C03C 27/04 (Joining glass to metal by means of an interlayer)
Electrodes or electrode layers that are inside multilayer ceramics, e.g. multilayer ceramic capacitors (unless it is mentioned that these electrodes are used specifically for joining)	H01G 4/30 (stacked capacitors)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Honeycomb structures assembled from subunits characterised by the material used for joining separate subunits	C04B 38/0019
Cement, concrete, mortar or artificial stone mixtures used as glue or binder for uniting building or structural materials	C04B 2111/00637
Thickness of the interlayer	C04B 2237/708
Chemical nature of materials in mouldable or extrudable form for sealing or packing joints or covers: Oxides, hydroxides, carbonates	C09K 2200/0239
Chemical nature of materials in mouldable or extrudable form for sealing or packing joints or covers: Silica-rich compounds, e.g. silicates, cement, glass	C09K 2200/0243 and subgroups
Chemical nature of materials in mouldable or extrudable form for sealing or packing joints or covers: ceramics	C09K 2200/0269
Seals between parts of vessels of electric discharge tubes or discharge lamps	H01J 5/20

Special rules of classification

Documents classified in C04B 38/0019 should normally also be classified in C04B 37/003, as most honeycombs are made from ceramic material. The interlayer used for joining the honeycomb parts receives a symbol from C04B 2237/04-C04B 2237/16.

C04B 2237/04

Ceramic interlayers

Definition statement

This place covers:

All interlayers consisting mainly out of a ceramic material, the ceramic materials being the materials that are classified in C04B 33/00 (clay materials), C04B 35/00-C04B 35/597 (ceramic materials), C04B 35/62204 (ceramic materials made out of waste material), C04B 35/62227(ceramic fibers), C04B 35/628 (coated ceramic powders or coated ceramic fibers), C04B 35/6303 (inorganic additives), C04B 35/66 (refractories and refractory mortars) and C04B 35/71-C04B 35/83 (ceramic materials containing macroscopic reinforcing agents), where consisting mainly means that the ceramic materials at least have to form the largest fraction.

References

Limiting references

This place does not cover:

Interlayers that are glass-ceramic material	C04B 2237/10
Joining glass to metal by means of an interlayer consisting of glass, glass-ceramic or ceramic material only	C03C 27/044

Special rules of classification

If the interlayer is a mixture of ceramic and metallic material, e.g. a cermet, then contrary to what is done with the substrates (cermets are coded with the metals normally), the cermet interlayer receives a symbol from C04B 2237/04-C04B 2237/083 to indicate the largest ceramic fraction and also the symbol C04B 2237/126 (or a symbol form subgroups of C04B 2237/126, if appropriate) to indicate that the active fraction is a metal.

C04B 2237/06

Oxidic interlayers

Definition statement

This place covers:

All oxide materials that are normally, as a ceramic material, are classified in the groups C04B 35/01-C04B 35/51, thus also phosphate materials.

C04B 2237/062

based on silica or silicates

Definition statement

This place covers:

All materials mainly comprising silica and silicates, e.g. lanthanum silicate (LaSiO3), all alumino-silicates, such as clays

References

Limiting references

This place does not cover:

zircon (ZrSiO4)	C04B 2237/068

C04B 2237/064

based on alumina or aluminates

Definition statement

This place covers:

all aluminates, e.g. spinel (MgAl2O4), lanthanum aluminate (LaAlO3), all alumina materials such gamma-alumina, boehmite, corundum, gibbsite, etc.

References

Limiting references

This place does not cover:

alumino-silicates	C04B 2237/062

C04B 2237/066

based on rare earth oxides

Definition statement

This place covers:

all rare earth oxides not present in a chemical compound with oxides other than rare earth oxides, e.g. Y_2O_3, Ce_2O_3, CeO_2, La_2O_3, $LaCeO_3$, $YLaO_3$

References

Limiting references

This place does not cover:

rare earth ferrite interlayer	C04B 2237/06
rare earth cuprate interlayer	C04B 2237/06
rare earth phosphate interlayer	C04B 2237/06
rare earth silicate interlayer	C04B 2237/062
rare earth aluminate interlayer	C04B 2237/064
rare earth titanate interlayer	C04B 2237/068
rare earth zirconate interlayer	C04B 2237/068
rare earth niobate interlayer	C04B 2237/068
rare earth chromite interlayer	C04B 2237/068

C04B 2237/068

based on refractory oxides, e.g. zirconia

Definition statement

This place covers:

materials based on the oxides of the nine refractory oxides, e.g. all titanates, such as barium titanate ($BaTiO_3$), aluminium titanate (Al_2TiO_5), bismuth titanate ($Bi_4Ti_3O_{12}$) and all titania based material; all materials consisting mainly of zirconates and hafnates, such as zircon ($ZrSiO_4$), calcium zirconate (Ca_2ZrO_4), lead hafnate ($PbHfO_3$), zirconate-titanates such as PZT (lead zirconate-titanate), for all values for the relation Ti/Zr; all zirconia based materials such as yttria-stabilised-zirconia (YSZ), unstabilised zirconia, cubic zirconia, etc.; all niobates such as alkaline earth niobates ($Na_{0.5}K_{0.5}NbO_3$)

References

Limiting references

This place does not cover:

other refractory oxide materials such as alumina,or magnesia	C04B 2237/064, C04B 2237/06
refractory non-oxide materials such as silicon carbide	C04B 2237/083

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

refractory metal oxides	titanium oxide, vanadium oxide, chromium oxide, zirconium oxide, niobium oxide, molybdenum oxide, hafnium oxide, tantalum oxide, tungsten oxide

C04B 2237/08

Non-oxidic interlayers

Definition statement

This place covers:

Materials based on all non-oxide materials that are classified in the groups C04B 35/515-C04B 35/597, e.g. nitrides such as silicon nitride (Si_3N_4), aluminium nitride (AlN) or boron nitride (BN), carbonitrides, borides such as magnesium boride (MgB_2) or titanium boride (TiB_2), silicides such as molybdenum silicide ($MoSi_2$), fluorides such as aluminium fluoride (AlF_3), sulfides, selenides. It also covers non-oxide layers that are formed in-situ during bonding, e.g. a silicon nitride layer that is formed during bonding, due to the reaction of the Si interlayer with a nitrogen-containing substrate

C04B 2237/083

Carbide interlayers, e.g. silicon carbide interlayers

Definition statement

This place covers:

all carbide interlayers, whether they are present before bonding or whether they are formed in-situ during bonding, e.g. a Ti-layer reacts during bonding to form a TiC-interlayer

References

Limiting references

This place does not cover:

carbonitrides, e.g. SiCN, or oxycarbonitrides, e.g. AlCON	C04B 2237/08

C04B 2237/086

Carbon interlayers

Definition statement

This place covers:

All interlayers based on inorganic carbon, e.g. graphite, diamond, carbon nanotubes, fullerenes, carbon black, glassy carbon

References

Limiting references

This place does not cover:

interlayers based on organic carbon, e.g. pitch, tar, polymers	C04B 37/008, C04B 37/028, C04B 37/047

Special rules of classification

If the joining composition is a mixture of carbon and polymer, both C04B 37/008 and C04B 37/005 are given.

C04B 2237/09

wherein the active component for bonding is not the largest fraction of the interlayer

Definition statement

This place covers:

An interlayer that for the largest part contains ceramic components, where the component responsible for the bonding with the substrate is not the component present as the largest fraction.

References

Limiting references

This place does not cover:

Glass is the minority and ceramic phases the majority, but the glass forms a continuous phase as a binding phase	C04B 2237/10
cermet interlayers, interlayers containing a majority of ceramic material with a metallic binder	C04B 2237/126 and s subgroups

Special rules of classification

This symbol will always be given in combination with a symbol from C04B 2237/04 - C04B 2237/083, since the largest component has to be a ceramic component

C04B 2237/095

The active component for bonding being silicon

Definition statement

This place covers:

An interlayer that for the largest part contains ceramic components, where the component responsible for the bonding with the substrate is not the component present as the largest fraction, but is Si

References

Limiting references

This place does not cover:

cermet interlayers, interlayers containing a majority of ceramic material with a metallic binder	C04B 2237/126

Special rules of classification

This symbol will always be given in combination with a symbol from C04B 2237/04 - C04B 2237/083, since the largest component has to be a ceramic component

C04B 2237/10

Glass interlayers, e.g. frit or flux

Definition statement

This place covers:

Glass and glass-ceramic interlayers. Also when glass is the minority and ceramic phases the majority, but the glass forms a continuous phase as a binding phase, this symbol is given. When a frit or flux is melted to form an interlayer, this symbol is used as well.

References

Limiting references

This place does not cover:

Joining glass to metal by means of an interlayer consisting of glass, glass-ceramic or ceramic material only	C03C 27/044
Joining metals with the aid of glass	C03C 29/00

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

glass-ceramic	a crystallised glass or a mixture of glass particles and ceramic particles, in which the glass forms a continuous matrix phase

C04B 2237/12

Metallic interlayers

Definition statement

This place covers:

metallic interlayers, cermet interlayer in which the metal is the bonding material, e.g. zinc or a mixture , also metallic layers that react during bonding to form a ceramic layer, e.g. Ti-layer that reacts to form TiC

References

Limiting references

This place does not cover:

Joining glass to metal by means of an interlayer consisting of metals, metal oxides or metal salts only	C03C 27/046
Joining glass to glass by means of an interlayer with the aid of intervening metal	C03C 27/08

Informative references

Attention is drawn to the following places, which may be of interest for search:

Rods, electrodes, materials, or media, for use in soldering, welding, or cutting: Interlayers, transition pieces for metallurgical bonding of workpieces	B23K 35/001 and subgroups
Selection of soldering or welding materials proper	B23K 35/24 and subgroups

Special rules of classification

If it is mentioned that methods such as brazing or soldering, in which the joining material is always metallic, are used, but the metal used for brazing or soldering is not specified, then C04B 2237/12 can be allocated.

Electrode and electrodes layers that are inserted between ceramic substrate layers are normally not seen as interlayer, since they normally do not have the function of joining the two ceramic substrates. They therefore are not classified with a C04B 2237/12 symbol. Only if it is clear that the electrode does have a joining effect, it is regarded as interlayer, and C04B 2237/12 or a symbol of its subgroups is given.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

cermet	a mixture of a ceramic phase and a metal phase, in which the metal phase forms a continuous matrix

C04B 2237/121

based on aluminium

Definition statement

This place covers:

alloys in which aluminium has the largest weight fraction and all aluminides or aluminide alloys, e.g. titanium aluminide (TiAl), nickel aluminide (Ni3Al)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Rods, electrodes, materials, or media, for use in soldering, welding, or cutting: Interlayers, transition pieces for metallurgical bonding of workpieces	B23K 35/001 and subgroups
Selection of soldering or welding materials proper with the principal constituent melting at less than 950 degrees C: Al as the principal constituent	B23K 35/286

C04B 2237/122

based on refractory metals

Definition statement

This place covers:

Interlayers having as the largest fraction alloys in which the nine refractory metals together have the largest weight fraction. For instance, if the interlayer has the composition $Cu_{50}Ti_{25}Zr_{25}$, both C04B 2237/122 and C04B 2237/124 are given, since copper and refractory metals are present in equal amount. If the interlayer has the composition $Fe_{40}Ti_{30}V_{15}Ag_{15}$, only C04B 2237/122 is given.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Selection of soldering or welding materials proper with the principal constituent melting at more than 1550 degrees C	B23K 35/32
Selection of soldering or welding materials proper with the principal constituent melting at more than 1550 degrees C; Ti as the principal constituent	B23K 35/325

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

refractory metal	titanium , vanadium , chromium , zirconium , niobium , molybdenum , hafnium , tantalum , tungsten

C04B 2237/123

based on iron group metals, e.g. steel

Definition statement

This place covers:

Alloys in which the three iron group metals together have the largest weight fraction. If the interlayer has the composition $Ti_{40}Fe_{30}Ni_{12}Ag_{18}$, only C04B 2237/123 is given, since Fe and Ni together are the largest fraction.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Selection of soldering or welding materials proper with the principal constituent melting at less than 1550 degrees C: Ni as the principal constituent	B23K 35/3033 and subgroups
Selection of soldering or welding materials proper with the principal constituent melting at less than 1550 degrees C: Co as the principal constituent	B23K 35/3046
Selection of soldering or welding materials proper with the principal constituent melting at less than 1550 degrees C: Fe as the principal constituent	B23K 35/3053 and subgroups

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

iron group metals	Fe, Co, Ni

C04B 2237/124

based on copper

Definition statement

This place covers:

Alloys in which copper has the largest weight fraction.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Selection of soldering or welding materials proper with the principal constituent melting at less than 1550 degrees C: Cu as the principal constituent	B23K 35/302

C04B 2237/125

based on noble metals, e.g. silver

Definition statement

This place covers:

Alloys in which the eight noble metals together have the largest weight fraction. If the interlayer has the composition $Fe_{45}Pd_{20}Pt_{20}Ag_{10}Ti_5$, only C04B 2237/125 is given, since Pd, Pt and Ag together are the largest fraction.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Selection of soldering or welding materials proper with the principal constituent melting at less than 1550 degrees C: Ag as the principal constituent	B23K 35/3006
Selection of soldering or welding materials proper with the principal constituent melting at less than 1550 degrees C: Au as the principal constituent	B23K 35/3013
Selection of soldering or welding materials proper with the principal constituent melting at more than 1550 degrees C; a Pt-group metal as principal constituent	B23K 35/322

Special rules of classification

Often interlayer materials based on noble metals contain minorities of other metals. These other metals usually form the active component, since noble metals are not very reactive. The C04B 2237/126 symbol and symbols of its subgroups can be used to indicate the presence of these minority metals, even if it is not mentioned that these minority metals are the active component, since it can be assumed these minority metals act as active component.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

noble metals	ruthenium (Ru), rhodium (Rh), palladium (Pd), silver (Ag), Osmium (Os), iridium (Ir), Platinum (Pt), gold (Au)

C04B 2237/126

wherein the active component for bonding is not the largest fraction of the interlayer

Definition statement

This place covers:

An interlayer that has a metallic nature, where the component responsible for the bonding with the substrate is not the component present as the largest fraction. The interlayer can either be a cermet, where ceramic material form the majority but the bonding component is a metal, or the interlayer can be a metallic alloy, having at least two different metals. You can have more than one active component per joining composition. The amount of active component can be very low, lower even than 1 wt% or 1 mole%.

Special rules of classification

This symbol will normally be given in combination with a symbol from C04B 2237/12 - C04B 2237/125, since the largest component normally is a metallic component. In the case of a cermet mixture C04B 2237/12 is given as well.

Synonyms and Keywords

In patent documents, the following expressions/words are often used as synonyms.

Active component	wetting component, wetting agent, joining component, joining agent

C04B 2237/127

The active component for bonding being a refractory metal

Definition statement

This place covers:

An interlayer that has a metallic nature, where the component responsible for the bonding with the substrate is not the component present as the largest fraction, this active component being a refractory metal. The interlayer can either be a cermet, where ceramic material form the majority but the bonding component is a refractory metal, or the interlayer can be a metallic alloy, containing the refractory metal as a minor component.

Special rules of classification

This symbol will normally be given in combination with a symbol from C04B 2237/12 - C04B 2237/125, since the largest component normally is a metallic component. In the case of a cermet mixture C04B 2237/12 is given as well.

C04B 2237/128

The active component for bonding being silicon

Definition statement

This place covers:

An interlayer that has a metallic nature, where the component responsible for the bonding with the substrate is not the component present as the largest fraction, this active component being silicon. The interlayer can either be a cermet, where ceramic material form the majority but the bonding component is a metal, where silicon is also present, or the interlayer can be a metallic alloy, containing silicon as a minor component.

Special rules of classification

This symbol will normally be given in combination with a symbol from C04B 2237/12 - C04B 2237/125, since the largest component normally is a metallic component. In the case of a cermet mixture C04B 2237/12 is given as well.

C04B 2237/16

Silicon interlayers

Definition statement

This place covers:

Alloys in which Si has the largest weight fraction, but has not reacted to form a silicide compound. If the starting material of the bonding layer is Si and the Si reacts during bonding to something else, e.g. SiC, then both the Si starting layer and SiC final layer are coded.

References

Limiting references

This place does not cover:

silica interlayers	C04B 2237/062
silicate interlayers	C04B 2237/062
silicon nitride (Si_3N_4) interlayers	C04B 2237/08
silicide interlayers, e.g. MoSi2	C04B 2237/08
silicon carbide interlayers	C04B 2237/083

C04B 2237/30

Composition of layers of ceramic laminates or of ceramic or metallic articles to be joined by heating, e.g. Si substrates

Definition statement

This place covers:

all individual layers of a ceramic laminate classified in B32B 18/00; all objects that are joined, either directly or by use of an interlayer, and are classified in C04B 37/00 and subgroups, this can be a layer but also tubes, fiber forms, etc. Substrates that are neither ceramic nor metallic will be classified also with the symbol C04B 2237/30. These are half-metals such as Si polymers, single crystals

References

Limiting references

This place does not cover:

the composition of interlayers, the layers that are used for the joining	C04B 2237/02- C04B 2237/16

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

substrate	the object that is joined or is part of the laminate

C04B 2237/32

Ceramic

Definition statement

This place covers:

All layers/objects consisting mainly out of a ceramic material, the ceramic materials being the materials that are classified in C04B 33/00 and subgroups (clay materials), C04B 35/00-C04B 35/597 (ceramic materials), C04B 35/62204 (ceramic materials made out of waste material), C04B 35/66 (refractories and refractory mortars) and C04B 35/71-C04B 35/83 (ceramic materials containing macroscopic reinforcing agents), where consisting mainly means that the ceramic materials at least have to form the largest fraction.

References

Limiting references

This place does not cover:

layers/objects that are glass-ceramic material	C04B 37/04 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramic substrate/layer characterised by its composition	C04B 35/00 and subgroups
Thickness of the ceramic substrate	C04B 2237/706
Laminates containing only one ceramic layer	B32B 9/005 and subgroups

C04B 2237/34

Oxidic

Definition statement

This place covers:

All oxide materials that are normally, as a ceramic material, are classified in the groups C04B 35/01-C04B 35/51, thus also phosphate materials.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramic oxide based substrate/layer characterised by its composition	C04B 35/01 and subgroups

C04B 2237/341

Silica or silicates

Definition statement

This place covers:

All materials mainly comprising silica and silicates, e.g. lanthanum silicate (LaSiO3), all alumino-silicates, such as clays, silicates such as mullite, cordierite, spodumene, forsterite, wollastonite

References

Limiting references

This place does not cover:

zircon (ZrSiO4)	C04B 2237/348

Informative references

Attention is drawn to the following places, which may be of interest for search:

Clay based substrate/layer characterised by its composition	C04B 33/00 and subgroups
Silica based substrate/layer characterised by its composition	C04B 35/14
Silicate based substrate/layer characterised by its composition	C04B 35/16 and s subgroups

C04B 2237/343

Alumina or aluminates

Definition statement

This place covers:

all aluminates, e.g. spinel (MgAl2O4), lanthanum aluminate (LaAlO3), all alumina materials such gamma-alumina, boehmite, corundum, gibbsite, etc.

References

Limiting references

This place does not cover:

alumino-silicates	C04B 2237/341

Informative references

Attention is drawn to the following places, which may be of interest for search:

Alumina based substrate/layer characterised by its composition	C04B 35/10 and s subgroups
Aluminate based substrate/layer characterised by its composition	C04B 35/44 and subgroups

C04B 2237/345

Refractory metal oxides

Definition statement

This place covers:

materials based mainly on the oxides of the nine refractory oxides, e.g. all niobates such as alkaline earth niobates (Na0.5K0.5NbO3)

References

Limiting references

This place does not cover:

other refractory oxide materials such as alumina,or magnesia	C04B 2237/343, C04B 2237/34
refractory non-oxide materials such as silicon carbide	C04B 2237/365 (SiC)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Chromium oxide based substrate/layer characterised by its composition	C04B 35/12
Chromite based substrate/layer characterised by its composition	C04B 35/42
Vanadium, niobium, tantalum, molybdenum or tungsten oxide, or vanadate, niobate, tantalate, molybdate or tungstate based substrate/ layer characterised by its composition	C04B 35/495 and subgroups

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

refractory oxides	titanium oxide, vanadium oxide, chromium oxide, zirconium oxide, niobium oxide, molybdenum oxide, hafnium oxide, tantalum oxide, tungsten oxide

C04B 2237/346

Titania or titanates

Definition statement

This place covers:

All titanates, e.g. barium titanate ($BaTiO_3$), aluminium titanate (Al_2TiO_5), bismuth titanate ($Bi_4Ti_3O_{12}$) and all titania based material

References

Limiting references

This place does not cover:

niobate-titanate containing more niobium than titanium	C04B 2237/345

zirconate-titanates such as PZT (lead zirconate-titanate), for all values for the relation Ti/Zr	C04B 2237/348

Informative references

Attention is drawn to the following places, which may be of interest for search:

Titania or titanate based substrate/layer characterised by its composition	C04B 35/46 and subgroups

C04B 2237/348

Zirconia, hafnia, zirconates or hafnates

Definition statement

This place covers:

all materials consisting mainly of zirconates and hafnates, such as zircon (ZrSiO4), calcium zirconate (Ca2ZrO4), lead hafnate (PbHfO3), zirconate-titanates such as PZT (lead zirconate-titanate), for all values for the relation Ti/Zr; all zirconia based materials such as yttria-stabilised-zirconia (YSZ), unstabilised zirconia, cubic zirconia, etc.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Zirconia, hafnia, hafnate or zirconate based substrate/layer characterised by its composition	C04B 35/48 and subgroups
Fuel cells with solid electrolyte, where the electrolyte contains zirconia	H01M 8/1253

C04B 2237/36

Non-oxidic

Definition statement

This place covers:

Materials based on all non-oxide materials that are classified in the groups C04B 35/515-C04B 35/597, e.g. carbides such as boron carbide (B4C), nitrides such as titanium nitride (TiN), carbonitrides such as silicon carbonitride (SiCN), borides such as magnesium boride (MgB2) or titanium boride (TiB2), silicides such as molybdenum silicide (MoSi2), fluorides such as aluminium fluoride (AlF3), sulfides, selenides.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Non-oxide based substrate/layer characterised by its composition	C04B 35/515 and subgroups

C04B 2237/361

Boron nitride

Definition statement

This place covers:

layers/objects based on boron nitride, carbo boron nitride, boron oxynitride, materials that would be classified in the groups C04B 35/583 and C04B 35/5831

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Boron nitride based substrate/layer characterised by its composition	C04B 35/583 and subgroups

C04B 2237/363

Carbon

Definition statement

This place covers:

Layers/objects made of material that consists for the largest fraction of carbon or carbon-like materials, materials that would be classified in the groups C04B 35/52 - C04B 35/536, thus graphite, diamond, glassy carbon, expanded graphite, etc.

References

Limiting references

This place does not cover:

carbide based layers/objects	C04B 2237/365 (SiC) or C04B 2237/36 (other carbides)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Carbon based substrate/layer characterised by its composition	C04B 35/52 and subgroups

C04B 2237/365

Silicon carbide

Definition statement

This place covers:

layers/objects based on silicon carbide (SiC), silicon boron carbide (SiBC), silicon oxy-carbide (SiOC), silicon carbide reinforced with (any kind of) fibers, materials that would be classified in the groups C04B 35/565 - C04B 35/5755

References

Limiting references

This place does not cover:

silicon carbonitride (SiCN)	C04B 2237/368 (silicon nitride)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Silicon carbide based substrate/layer characterised by its composition	C04B 35/565 and subgroups

C04B 2237/366

Aluminium nitride

Definition statement

This place covers:

layers/objects based on aluminium nitride (AlN), aluminium oxynitride (AlON), aluminium carbonitride (AlCN), aluminium boronitride (AlBN), materials that would be classified in the group C04B 35/581

References

Limiting references

This place does not cover:

layers or objects based on sialon	C04B 2237/368 (silicon nitride)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Aluminum nitride based substrate/layer characterised by its composition	C04B 35/581

C04B 2237/368

Silicon nitride

Definition statement

This place covers:

layers/objects based on silicon nitride (Si_3N_4), silicon oxynitride (SiON), silicon aluminium oxynitride (Sialon), silicon carbonitride (SiCN), silicon boronitride (SiBN), silicon nitride reinforced with (any kind of) fibers, materials that would be classified in the groups C04B 35/584 - C04B 35/597

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Silicon nitride based substrate/layer characterised by its composition	C04B 35/584 and subgroups

C04B 2237/38

Fiber or whisker reinforced

Definition statement

This place covers:

all ceramic layers/objects containing fibers, whiskers, nanotubes, nanowires and similar elongated reinforcements

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Clay ware based substrate/layer containing fibers or whiskers characterised by its composition	C04B 33/36
Ceramic substrate/layer containing metallic fibers or whiskers characterised by its composition	C04B 35/76
Ceramic substrate/layer containing non-metallic fibers or whiskers characterised by its composition	C04B 35/80 and subgroups

Special rules of classification

The matrix of the reinforced ceramic layer/object should be indicated with a symbol from C04B 2237/32 - C04B 2237/368. The symbol C04B 2237/38 therefore is always given together with another symbol from the range C04B 2237/32-C04B 2237/368.

C04B 2237/385

Carbon or carbon composite

Definition statement

This place covers:

Materials based on with carbon fibers reinforced carbon materials, which would be classified in C04B 35/83

References

Limiting references

This place does not cover:

Materials based on a carbide matrix reinforced with carbon fibers	C04B 2237/38 and C04B 2237/365 (silicon carbide matrix) or C04B 2237/38 (matrix made of other carbide material)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Carbon substrate/layer containing carbon fibers or whiskers characterised by its composition	C04B 35/83

Special rules of classification

In the case C04B 2237/385 is given, it is not necessary to also give the class C04B 2237/363, since C04B 2237/385 already indicates the matrix of the layer/object is mainly carbon

C04B 2237/40

Metallic

Definition statement

This place covers:

All layers/objects based on metallic phases as well as ceramic layers/objects having a metallic binder (cermets). If the layer/object has a continuous metallic phase, it is regarded as metallic, even if the amount of metal is as low as for instance 5 wt%.

References

Limiting references

This place does not cover:

Silicon layers/articles joined with a ceramic layer/article	C04B 2237/30
A second metal layer/object that is joined to a first metal layer/object, which itself is joined to a ceramic layer/object.	B32B 15/00 and subgroups (Layered products essentially comprising metal)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Thickness of the metallic substrate	C04B 2237/706
Manufacture of workpieces or articles from metallic powder characterised by the manner of compacting or sintering; Apparatus specially adapted therefore; Presses and furnaces	B22F 3/00 and subgroups
Manufacture of workpieces or articles from metallic powder characterised by the special shape of the product	B22F 5/00 and subgroups

C04B 2237/401

Cermets

Definition statement

This place covers:

Layers/objects containing a mixture of at least one ceramic material and one metallic material)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cermet substrate/layer containing carbon fibers or whiskers characterised by its composition	C22C 29/00 and subgroups

Special rules of classification

If the largest metallic fraction is one from the list of C04B 2237/402-C04B 2237/408, this symbol is given as well. The largest ceramic fraction is not classified with a ceramic layer/object symbol, since cermets are regarded intrinsically as metals.

C04B 2237/402

Aluminium

Definition statement

This place covers:

Layers/objects containing as the largest fraction alloys in which aluminium has the largest weight fraction, as well as all aluminides or aluminide alloys, e.g. titanium aluminide (TiAl), nickel aluminide (Ni3Al).

C04B 2237/403

Refractory metals

Definition statement

This place covers:

Layers/objects containing as the largest fraction alloys in which the nine refractory metals together have the largest weight fraction, e.g. $Mn_{40}Ti_{25}Nb_{25}Ag_{10}$ will be classified in C04B 2237/403, not C04B 2237/404 for the 40Mn, since Ti and Nb together have 50. Also a mixture of 95 wt% ceramic and 5 wt% $Mn_{40}Ti_{25}Nb_{25}Ag_{10}$ binder will be classified in C04B 2237/403 (together with C04B 2237/401).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Rods, electrodes, materials, or media, for use in soldering, welding, or cutting: Interlayers, transition pieces for metallurgical bonding of workpieces at least one of the workpieces being of a refractory metal	B23K 35/005

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

refractory metal	titanium , vanadium , chromium , zirconium , niobium , molybdenum , hafnium , tantalum , tungsten

C04B 2237/404

Manganese or rhenium

Definition statement

This place covers:

Layers/objects containing as the largest fraction alloys in which manganese and rhenium refractory metals together have the largest weight fraction, e.g. $Mn_{40}Ti_{25}Nb_{25}Ag_{10}$ will be classified in C04B 2237/403, not C04B 2237/404 for the 40Mn, since Ti and Nb together have 50. Also a mixture of 95 wt% ceramic and 5 wt% $Mn_{40}Ti_{25}Nb_{25}Ag_{10}$ binder will be classified in C04B 2237/403 (together with C04B 2237/401).

C04B 2237/405

Iron metal group, e.g. Co or Ni

Definition statement

This place covers:

Layers/objects containing as the largest fraction alloys in which the iron group metals together have the largest weight fraction, e.g. $Cr_{49}Fe_{20}Co_{20}Ni_{10}Ag_1$ will get C04B 2237/405, not C04B 2237/403 for the 49 Cr, since Fe, Co and Ni together have 50.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Rods, electrodes, materials, or media, for use in soldering, welding, or cutting: Interlayers, transition pieces for metallurgical bonding of workpieces at least one of the workpieces being of a metal of the iron group	B23K 35/004

C04B 2237/406

Iron, e.g. steel

Definition statement

This place covers:

Layers/objects containing as the largest fraction alloys in which iron has the largest weight fraction, e.g. $Cr_{49}Fe_{50}Ag_1$ will be classified in C04B 2237/406, while $Cr_{49}Fe_{48}Ni_2Ag_1$ will be classified in C04B 2237/405

C04B 2237/407

Copper

Definition statement

This place covers:

Layers/objects containing as the largest fraction alloys in which copper has the largest weight fraction

References

Limiting references

This place does not cover:

Rods, electrodes, materials, or media, for use in soldering, welding, or cutting: Interlayers, transition pieces for metallurgical bonding of workpieces at least one of the workpieces being of copper or another noble metal	B23K 35/007

C04B 2237/408

Noble metals, e.g. palladium, platina or silver

Definition statement

This place covers:

Layers/objects containing as the largest fraction alloys in which the eight noble metals together have the largest weight fraction, e.g. $Mn_{20}Re_{20}Pd_{10}Pt_{10}Rh_{10}Ru_{11}Ni_{19}$ will be classified in C04B 2237/408, not C04B 2237/404 for the 40 Mn and Rh, since the noble metals together have 41.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Rods, electrodes, materials, or media, for use in soldering, welding, or cutting: Interlayers, transition pieces for metallurgical bonding of workpieces at least one of the workpieces being of copper or another noble metal	B23K 35/007

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

noble metals	ruthenium (Ru), rhodium (Rh), palladium (Pd), silver (Ag), Osmium (Os), iridium (Ir), Platinum (Pt), gold (Au)

C04B 2237/50

Processing aspects relating to ceramic laminates or to the joining of ceramic articles with other articles by heating

Definition statement

This place covers:

The processes used in joining ceramic articles with other articles or making ceramic laminates

References

Limiting references

This place does not cover:

Details of heat treatments used in the joining or laminating process	C04B 2235/65-C04B 2235/668

Special rules of classification

The details of the heat treatments used in the joining or laminating process are classified as well with symbols from the range C04B 2235/65-C04B 2235/668. The heating rate, atmosphere used during the heat treatment, e.g. vacuum or hydrogen-containing, the use of multi-step heating treatments or use of wave energy or a laser for heating can all be classified with these symbols.

C04B 2237/52

Pre-treatment of the joining surfaces, e.g. cleaning, machining

Definition statement

This place covers:

Cleaning of the surfaces to-be-joined with solvents or with acids that etch the surface, vacuum cleaning, wiping, scraping, machining the surface-to-be-treated etc.

References

Limiting references

This place does not cover:

treatment of a ceramic surface that is not to be joined involving the removal of at least part of the materials of the treated article	C04B 41/53 and subgroups
cleaning of ceramic objects in general	B28B 11/22
cutting of ceramic	B28D 1/22 , B28B 11/14, B23K 26/006 (with laser beam)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Surface roughness of a ceramic substrate	C04B 2235/963
Adhesive processes involving pre-treatment of the surfaces to be joined	C09J 5/02
etching, surface-brightening or pickling compositions	C09K 13/00 and subgroups

Special rules of classification

If the surface of the ceramic substrate is machined to obtain a certain surface roughness, C04B 2235/963 (surface properties of ceramics) is allocated and C04B 2237/52 does not need to be given anymore. If the surface of the metal, glass or other non-ceramic substrate is machined, C04B 2237/52 is allocated.

C04B 2237/525

by heating

Definition statement

This place covers:

Heat treatment of the surface which does not lead to bonding or to the creation of a bonding layer, but is directed at removing things from the surface that prevent bonding

References

Limiting references

This place does not cover:

Oxidising a surface before joining	C04B 2237/54
Pre-heat treatment of a substrate other than oxidation treatment in order to form an active joining layer	C04B 2237/55

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cleaning the surface of a ceramic substrate by burning	C04B 41/5392
Details of heat treatments used in the joining or laminating process	C04B 2235/65- C04B 2235/668

C04B 2237/54

Oxidising the surface before joining

Definition statement

This place covers:

Any oxidation treatment before bonding of a surface that is later joined to another surface

References

Limiting references

This place does not cover:

Oxidation of pore formers	C04B 38/00 and subgroups
Heat treatment of the surface which does not lead to bonding or to the creation of a bonding layer, but is directed at removing things from the surface that prevent bonding	C04B 2237/525

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating or impregnating involving the chemical conversion of an already applied layer, e.g. obtaining an oxide layer by oxidising an applied metal layer	C04B 41/4558 and s subgroups
Oxidative annealing of shaped ceramics	C04B 2235/663
Pre-heat treatment of a substrate other than oxidation treatment in order to form an active joining layer	C04B 2237/55

C04B 2237/55

Pre-treatments of a coated or not coated substrate other than oxidation treatment in order to form an active joining layer

Definition statement

This place covers:

For instance heating a substrate already coated with a joining layer to activate/pre-react the joining layer, before joining with the other substrate

References

Limiting references

This place does not cover:

Heat treatments done while coating a substrate with a joining interlayer	C04B 2235/65- C04B 2235/668
Heat treatment of the surface which does not lead to bonding or to the creation of a bonding layer, but is directed at removing things from the surface that prevent bonding	C04B 2237/525

Informative references

Attention is drawn to the following places, which may be of interest for search:

Oxidising a surface before joining	C04B 2237/54

Special rules of classification

During the application of a bonding layer to a to-be-joined substrate usually heating is used for the application of the coating that will form the bonding layer. In this case C04B 2237/55 is not used. Only if after the step of coating the substrate a non-oxidising heating treatment is performed in order to prepare the coating for the bonding step, C04B 2237/55 is used.

C04B 2237/555

on a substrate not containing an interlayer coating, leading to the formation of an interlayer coating

Definition statement

This place covers:

For instance a reduction treatment to form a reduced surface layer, e.g. heating a Si_3N_4 substrate in a reducing atmosphere to form a Si-layer at the surface

References

Limiting references

This place does not cover:

Heat treatments done while coating a substrate with a joining interlayer	C04B 2235/65-C04B 2235/668
Heat treatment of the surface which does not lead to bonding or to the creation of a bonding layer, but is directed at removing things from the surface that prevent bonding	C04B 2237/525

Informative references

Attention is drawn to the following places, which may be of interest for search:

Reduction treatment for making a ceramic	C04B 2235/652
Reductive annealing of shaped ceramics	C04B 2235/664
Oxidising a surface before joining	C04B 2237/54

C04B 2237/56

Using constraining layers before or during sintering

Definition statement

This place covers:

Layers or objects that are temporarily attached or put next to other layers/objects with the aim of hindering any movement of the other layers/objects, e.g. hindering shrinkage during the heat treatment due to the fact that the constraining layer has a higher sintering temperature

Relationships with other classification places

Furnaces, kilns, ovens, or retorts F27

References

Limiting references

This place does not cover:

Pressure sintering of clay ceramics	C04B 33/326
Pressure sintering of ceramics	C04B 35/645 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Using setters during sintering	C04B 2235/9623
Thickness of the constraining layer	C04B 2237/702

Special rules of classification

Weights that are put on the substrates or clamps that are used to restrain the substrate also are regarded as constraining layers.

C04B 2237/561

Constraining layers not covering the whole surface of the layers to be sintered, e.g. constraining layers with holes

Definition statement

This place covers:

A constraining layer that for instance is shorter than the layer it is covering

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Forming laminates or joined articles comprising holes, channels or other types of openings	C04B 2237/62
Thickness of the constraining layer	C04B 2237/702
Joining the largest surface of one substrate with a smaller surface of the other substrate, e.g. butt joining or forming a T-joint	C04B 2237/80
Both substrates not completely covering the other substrate, e.g. two plates in a staggered position	C04B 2237/82
Joining of two substrates at their largest surfaces, one surface being complete joined and covered, the other surface not, e.g. a small plate joined at its largest surface on top of a larger plate	C04B 2237/86

C04B 2237/562

made of alumina or aluminates

Definition statement

This place covers:

constraining layers made of aluminates, e.g. spinel (MgAl2O4), lanthanum aluminate (LaAlO3), or alumina materials such gamma-alumina, boehmite, corundum, gibbsite, etc.

References

Limiting references

This place does not cover:

alumino-silicate constraining layers	C04B 2237/56

Informative references

Attention is drawn to the following places, which may be of interest for search:

Alumina or aluminate substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/343

C04B 2237/564

made of glass

Definition statement

This place covers:

glass and glass-ceramic constraining layers

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Glass substrate joined with a ceramic substrate	C04B 37/04 and sub-classes

C04B 2237/565

made of refractory metal oxides, e.g. zirconia

Definition statement

This place covers:

constraining layers made of materials based on the oxides of the nine refractory oxides, e.g. all titanates, such as barium titanate ($BaTiO_3$), aluminium titanate (Al_2TiO_5), bismuth titanate ($Bi_4Ti_3O_{12}$) and all titania based material; all materials consisting mainly of zirconates and hafnates, such as zircon ($ZrSiO_4$), calcium zirconate (Ca_2ZrO_4), lead hafnate ($PbHfO_3$), zirconate-titanates such as PZT (lead zirconate-titanate), for all values for the relation Ti/Zr; all zirconia based materials such as yttria-stabilised-zirconia (YSZ), unstabilised zirconia, cubic zirconia, etc.; all niobates such as alkaline earth niobates ($Na_{0.5}K_{0.5}NbO_3$).

References

Limiting references

This place does not cover:

other refractory oxide materials such as alumina, or magnesia	C04B 2237/562; C04B 2237/56
refractory non-oxide materials such as silicon carbide	C04B 2237/568

Informative references

Attention is drawn to the following places, which may be of interest for search:

Refractory metal oxide substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/345

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

refractory oxides	titanium oxide, vanadium oxide, chromium oxide, zirconium oxide, niobium oxide, molybdenum oxide, hafnium oxide, tantalum oxide, tungsten oxide

C04B 2237/567

made of metal

Definition statement

This place covers:

constraining layers/objects based on metallic phases as well as ceramic layers/objects having a metallic binder (cermets). If the layer/object has a continuous metallic phase, it is regarded as metallic, even if the amount of metal is as low as for instance 5 wt%.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Metal substrate joined with a ceramic substrate	C04B 37/02 and subgroups, C04B 2237/40 and subgroups

C04B 2237/568

made of non-oxide ceramics

Definition statement

This place covers:

constraining layers based on all non-oxide materials that are classified in the groups C04B 35/515-C04B 35/597, e.g. nitrides such as silicon nitride (Si_3N_4), aluminium nitride (AlN) or boron nitride (BN), carbonitrides, borides such as magnesium boride (MgB_2) or titanium boride (TiB_2), silicides such as molybdenum silicide ($MoSi_2$), carbides such as silicon carbide (SiC) or boron carbide (B_4C), fluorides such as aluminium fluoride (AlF_3), sulfides, selenides, carbon or carbon-like materials such as graphite, diamond, glassy carbon, expanded graphite, etc.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Non-oxide substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/36 and subgroups
Carbon fiber reinforced carbon substrate joined with another substrate or being part of a ceramic laminate	C04B 2237/385

C04B 2237/58

Forming a gradient in composition or in properties across the laminate or the joined articles

Definition statement

This place covers:

At least two adjacent layers/objects are similar but have a small difference in composition or properties, e.g. one ZTA-layer (zirconia-toughened alumina, zirconia with a minority of alumina) next to an ATZ-layer (alumina-toughened zirconia, alumina with a minority of zirconia)

References

Limiting references

This place does not cover:

Ceramic products with a gradient within one layer or monolithic object	C04B 2235/75
Two adjacent layers that have a completely different composition, e.g. one alumina layer next to a zirconia layer	B32B 18/00, C04B 37/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cement, concrete, mortar or artificial stone mixtures with a gradually increasing or decreasing concentration of ingredients or property from one layer to another	C04B 2111/00405

C04B 2237/582

by joining layers or articles of the same composition but having different additives

Definition statement

This place covers:

At least two adjacent layers/articles have the same main component, being the component present in the largest amount, but one or more different minor components

References

Limiting references

This place does not cover:

Adjacent layers/articles that have differing main components	B32B 18/00, C04B 37/00 and s subgroups

C04B 2237/584

the different additives being fibers or whiskers

Definition statement

This place covers:

At least two adjacent layers/objects contain fibers or whiskers, but the fibers or whiskers have a different composition, length, width or spatial orientation

References

Limiting references

This place does not cover:

A ceramic layer/article containing fibers of the same material but with different dimensions	C04B 2235/5272

C04B 2237/586

by joining layers or articles of the same composition but having different densities

Definition statement

This place covers:

Two adjacent layers/objects have a similar composition but a different relative density/porosity, e.g. one alumina layer with 50% porosity adjacent to an alumina layer with 70% porosity

References

Limiting references

This place does not cover:

One ceramic layer or article having a gradient in the density within that layer or article	C04B 2235/775
Two adjacent layers/articles having different absolute densities due to differing compositions	B32B 18/00, C04B 37/00 and subgroups

C04B 2237/588

by joining layers or articles of the same composition but having different particle or grain sizes

Definition statement

This place covers:

For instance one alumina layer has an average grain of 1 micron, while an adjacent alumina layer has an average grain size of 2 microns, due for instance to a small difference in the composition or to different pre-treatments

References

Limiting references

This place does not cover:

Two adjacent layers/articles having different grain sizes due to the fact that the compositions are very different	B32B 18/00, C04B 37/00 and subgroups

Informative references

Attention is drawn to the following places, which may be of interest for search:

Grain sizes and shapes of sintered or melt-casted ceramics	C04B 2235/78 and subgroups

Special rules of classification

If the difference in grain size is due to a small difference in composition, both C04B 2237/588 and C04B 2237/582 are given.

C04B 2237/59

Aspects relating to the structure of the interlayer

Definition statement

This place covers:

Aspects not relating to the composition of the interlayer, but the continuity and porosity of the interlayer

References

Limiting references

This place does not cover:

the composition of the interlayer	C04B 2237/02 and s subgroups
reaction phases at the interlayer-substrate joining area	C04B 2237/60

Informative references

Attention is drawn to the following places, which may be of interest for search:

thickness of the interlayer	C04B 2237/708
Two interlayers next to each other	C04B 2237/72

C04B 2237/592

whereby the interlayer is not continuous, e.g. not the whole surface of the smallest substrate is covered by the interlayer

Definition statement

This place covers:

The interlayer is interrupted, while the substrates or other interlayers on both sides continue, e.g. a printed or patterned interlayer is normally not continuous

References

Limiting references

This place does not cover:

An interruption of the interlayer due to openings/holes in at least one of the two substrates, e.g. an interruption of the interlayer due to the presence of an opening in the substrate as in C04B 2237/62	C04B 2237/62
Printed or patterned non-bonding electrodes not covering the whole ceramic substrate	B32B 18/00 or C04B 37/00 and subgroups

Special rules of classification

Electrodes that do not seem to have the function of bonding two substrates are not regarded as interlayer. If these electrodes are discontinuous, not covering the whole substrate they are coated on, as is usually the case, they therefore do not receive the symbol **M04B237/62B**.

C04B 2237/595

whereby the interlayer is continuous, but heterogeneous on macro-scale, e.g. one part of the interlayer being a joining material, another part being an electrode material

Definition statement

This place covers:

The interlayer is not interrupted, while the substrates or other interlayers on both sides continue. In a horizontal interlayer the different materials are encountered in a lateral direction.

References

Limiting references

This place does not cover:

An interlayer containing different materials that are homogeneously mixed, e.g. oxide powder mixed with fibers	C04B 2237/06 and subgroups
Interlayers being on a macro-scale heterogeneous, where one of the macro-parts is void, where the void continuous in the substrate	C04B 2237/62
Interlayers being on a macro-scale heterogeneous, where one of the macro-parts is void, where the void is restricted to the interlayer	**M04B237/62B**

Special rules of classification

Electrodes that do not seem to have the function of bonding two substrates are not regarded as interlayer. If these electrodes are discontinuous, not covering the whole substrate they are coated on, as is usually the case, they therefore do not receive the symbol **M04B237/62B**.

C04B 2237/597

whereby the interlayer is continuous but porous, e.g. containing hollow or porous particles, macro- or micropores or cracks

Definition statement

This place covers:

The interlayer is continuous, while the substrates on both sides continue

References

Limiting references

This place does not cover:

An interruption of the interlayer due to openings/holes in at least one of the two substrates, e.g. an interruption of the interlayer due to the presence of an opening in the substrate as in C04B 2237/62	C04B 2237/62

Informative references

Attention is drawn to the following places, which may be of interest for search:

Hollow or porous granular material used as fillers for mortars, concrete or artificial stone	C04B 20/002 and sub-classes
Porous or hollow ceramic granular materials, e.g. micro-balloons	C04B 38/009

C04B 2237/60

Forming at the joining interface or in the joining layer specific reaction phases or zones, e.g. diffusion of reactive species from the interlayer to the substrate or from a substrate to the joining interface, carbide forming at the joining interface

Definition statement

This place covers:

For instance a reaction between Si from the interlayer with C from the substrate in order to form SiC at the interphase between interlayer and substrate, or diffusion of Ti from a titanium alloy interlayer into a metallic substrate

References

Limiting references

This place does not cover:

reaction between two adjacent substrates, possibly resulting in the formation of an interlayer	C04B 37/001 (direct ceramic-ceramic junction) or C04B 37/021 (direct ceramic-metal junction) and C04B 2237/02-C04B 2237/16 for the in-situ formed interlayer

Informative references

Attention is drawn to the following places, which may be of interest for search:

Reaction sintering of free metal or free silicon containing compositions	C04B 35/65 and sub-classes

C04B 2237/61

Joining two substrates of which at least one is porous by infiltrating the porous substrate with a liquid, such as a molten metal, causing bonding of the two substrates, e.g. joining two porous carbon substrates by infiltrating with molten silicon

Definition statement

This place covers:

Infiltrating a porous ceramic with metal or silicon to join the resulting cermet or ceramic with a metal or ceramic substrate.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics based on carbon, made by impregnation of a carbon product with carbonisable material	C04B 35/521

Making silicon carbide ceramic by reaction sintering, e.g. infiltrating a porous carbon body with Si and let them react to form SiC	C04B 35/573
Reaction sintering of free metal or free silicon containing compositions	C04B 35/65 and subgroups
Porous ceramics in general	C04B 38/00 and subgroups
Non-superficial impregnation or infiltration of a ceramic substrate	C04B 41/457
Liquid infiltration of green bodies or pre-forms	C04B 2235/616

Special rules of classification

Normally a joint between a cermet and a metal substrate is not classified in C04B 37/00, only in the above-mentioned case that a porous ceramic is joined to a metal through an infiltrated metal. The infiltration can lead to a bonding layer in between the two bodies, but it is also possible that there is no bonding layer after bonding, which means the bonding is a direct bonding

C04B 2237/62

Forming laminates or joined articles comprising holes, channels or other types of openings

Definition statement

This place covers:

Laminates or joined articles having openings, for instance for electrodes and/or conductors. The openings normally should pass fully through at least one substrate layer. The openings normally are filled in the end-product with electrodes/conductors, but at least an intermediate product contains the hole.

References

Limiting references

This place does not cover:

Porous mortars, concrete, artificial stone or ceramic ware, containing continuous channels, e.g. of the "dead-end" type or obtained by pushing bars in the green ceramic product	C04B 38/0003
Porosity in honeycomb structures	C04B 38/0006 and subgroups
Laminates or joined articles having superficial holes, not penetrating the whole substrate layer	C04B 2237/64
Joined articles of which at least one article is a tube, at least one article being ceramic	C04B 2237/765

Informative references

Attention is drawn to the following places, which may be of interest for search:

Making a ceramic by shaping around a core that is later removed	C04B 2235/6028

C04B 2237/64

Forming laminates or joined articles comprising grooves or cuts

Definition statement

This place covers:

Openings/holes are at the surface of at least one of the substrates, but do not penetrate the whole substrate. The grooves can have the function of providing a mechanical bonding force at the joining surface, e.g. as saw-tooth on both substrate surfaces that are joined

References

Limiting references

This place does not cover:

Openings/holes that penetrate a whole substrate	C04B 2237/62

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramic articles per se containing grooves or cuts	C04B 2235/945
A ceramic surface having a certain surface roughness	C04B 2235/963

Special rules of classification

If the surface of a ceramic substrate has grooves or cuts on micro- or nano-level, C04B 2235/963 is attributed. If the surface roughness of the ceramic substrate is specified, C04B 2235/963 is used as well.

C04B 2237/66

Forming laminates or joined articles showing high dimensional accuracy, e.g. indicated by the warpage

Definition statement

This place covers:

Laminates/joined articles that should have very specific dimensions

References

Limiting references

This place does not cover:

Laminates/joined articles of which the dimensions are mentioned but no indication is given on the desirability of having those dimensions	C04B 37/00 and subgroups or B32B 18/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramics in general characterised by having a high dimensional accuracy, indicated e.g. by the tolerance	C04B 2235/9638

C04B 2237/68

Forming laminates or joining articles wherein at least one substrate contains at least two different parts of macro-size, e.g. one ceramic substrate layer containing an embedded conductor or electrode

Definition statement

This place covers:

The two different parts can be of the same material and of different material. It can be for instance a layer with a checkerboard pattern, containing blocks of two kinds of different material.

References

Limiting references

This place does not cover:

Substrates that contain two different materials mixed on a small scale, e.g. smaller than 1 mm, for instance a substrate containing a homogeneous mixture of ceramic and metallic material	C04B 2237/30 and subgroups

C04B 2237/70

Forming laminates or joined articles comprising layers of a specific, unusual thickness

Definition statement

This place covers:

The whole laminate/joined article having a certain specific thickness, and also the glass layer of a glass-ceramic joint having a certain specific thickness

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ceramic objects in general characterised by their dimensions, e.g. having a specific size	C04B 2235/95

C04B 2237/702

of one or more of the constraining layers

Definition statement

This place covers:

The constraining layer having a certain specific thickness

C04B 2237/704

of one or more of the ceramic layers or articles

Definition statement

This place covers:

The ceramic substrate having a certain specific thickness

References

Limiting references

This place does not cover:

ceramic interlayers having a specific thickness	C04B 2237/708

C04B 2237/706

of one or more of the metallic layers or articles

Definition statement

This place covers:

The metallic substrate having a certain specific thickness

References

Limiting references

This place does not cover:

metallic interlayers having a specific thickness	C04B 2237/708

C04B 2237/708

of one or more of the interlayers

Definition statement

This place covers:

all interlayers, whether ceramic, metallic, glass, silicon, adhesive resin, having a specific thickness

C04B 2237/72

Forming laminates or joined articles comprising at least two interlayers directly next to each other

Definition statement

This place covers:

Two substrates are joined by at least two interlayers. Non-bonding electrode layers do not count as interlayer.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Rods, electrodes, materials, or media, for use in soldering, welding, or cutting: layered sheets or foils for use in soldering or brazing	B23K 35/0238
Adhesive processes involving separate application of adhesive ingredients to the different surfaces to be joined	C09J 5/04

Special rules of classification

If there are two interlayers of which one is a non-bonding electrode layer, C04B 2237/72 is not attributed.

C04B 2237/74

Forming laminates or joined articles comprising at least two different interlayers separated by a substrate

Definition statement

This place covers:

A sandwich that has at least 3 substrates, substrate 1, substrate 2 and substrate 3. The interlayer 1 between substrate 1 and 2 is different from the second interlayer, interlayer 2, between substrate 2 and substrate 3.

Special rules of classification

Non-bonding electrode layers do not count as interlayer. If two substrates contain only a non-bonding electrode in between, these substrates are regarded to be directly bonded.

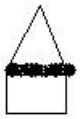
C04B 2237/76

Forming laminates or joined articles comprising at least one member in the form other than a sheet or disc, e.g. two tubes or a tube and a sheet or disc

Definition statement

This place covers:

Joining irregular shapes. Plates and discs are considered as regular shapes. A shaft or cylinder is considered as a regular shape as well.



References

Limiting references

This place does not cover:

joining of the blocks of a honeycomb	C04B 37/005
Sheets that are not joined at their longest side, but at one of the short sides	C04B 2237/68

C04B 2237/765

at least one member being a tube

Definition statement

This place covers:

Joining two substrates of which at least one is a tube, either ceramic or metallic

Special rules of classification

If C04B 2237/765 is given, C04B 2237/62 does not need to be given, since it is obvious a tube contains a hole.

C04B 2237/78

Side-way connecting, e.g. connecting two plates through their sides

Definition statement

This place covers:

Connecting substrates both at the sides that do not have the largest surface, e.g. two cylinders at the curved side, not at the end

References

Limiting references

This place does not cover:

Connecting one plate with its long side at another plate with its short side	C04B 2237/80

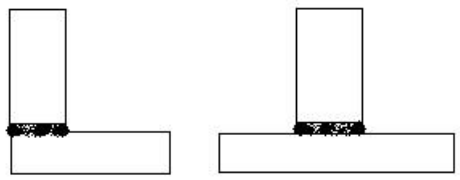
C04B 2237/80

Joining the largest surface of one substrate with a smaller surface of the other substrate, e.g. butt joining or forming a T-joint

Definition statement

This place covers:

Joining the side surface of a plate with the largest surface of another plate



References

Limiting references

This place does not cover:

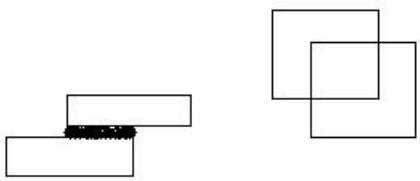
Joining the end of a cylinder with the largest surface of a plate	C04B 2237/765
Sheets that are joined at both their shortest side	C04B 2237/78

C04B 2237/82

Two substrates not completely covering each other, e.g. two plates in a staggered position

Definition statement

This place covers:



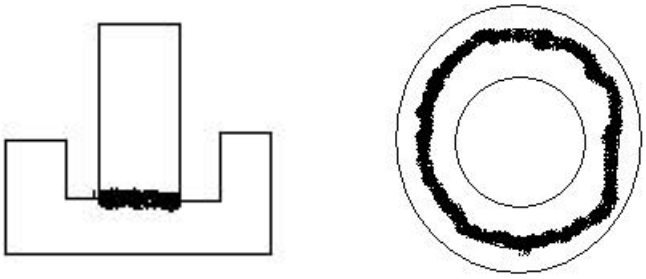
C04B 2237/84

Joining of a first substrate with a second substrate at least partially inside the first substrate, where the bonding area is at the inside of the first substrate, e.g. one tube inside another tube

Definition statement

This place covers:

The joining surface is for instance the inside of the outer tube and the outside of the inner tube. Or joining something to the inside of a vessel or to the inside of a box.



Special rules of classification

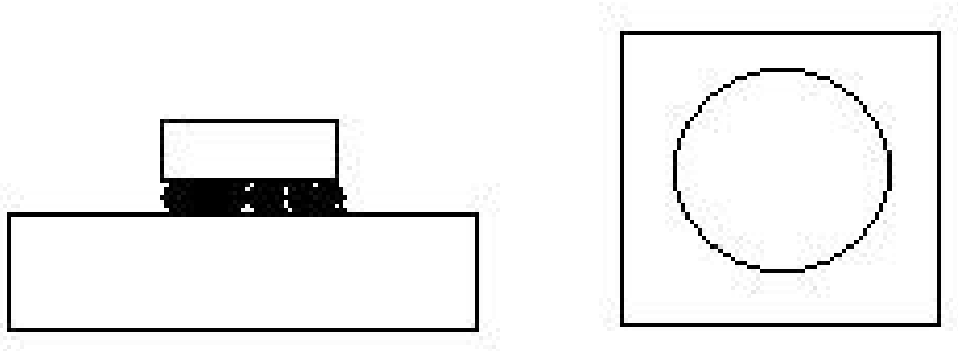
C04B 2237/62 and C04B 2237/64 do not need to be attributed for the hole/opening/groove that is used for joining. C04B 2237/62 and/or C04B 2237/64 might still need to be given for another hole/opening/groove.

C04B 2237/86

Joining of two substrates at their largest surfaces, one surface being complete joined and covered, the other surface not, e.g. a small plate joined at it's largest surface on top of a larger plate

Definition statement

This place covers:



References

Limiting references

This place does not cover:

Two plates that are joined at their largest surfaces with parts of both sheet remaining uncovered	C04B 2237/82

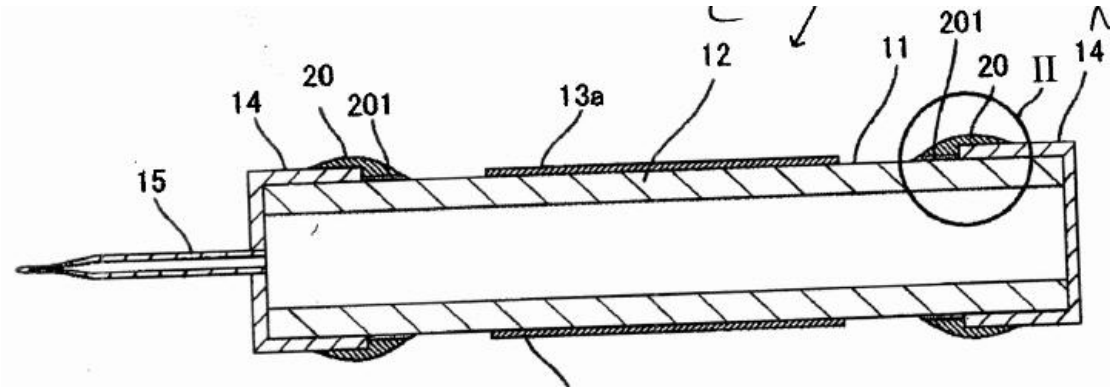
C04B 2237/88

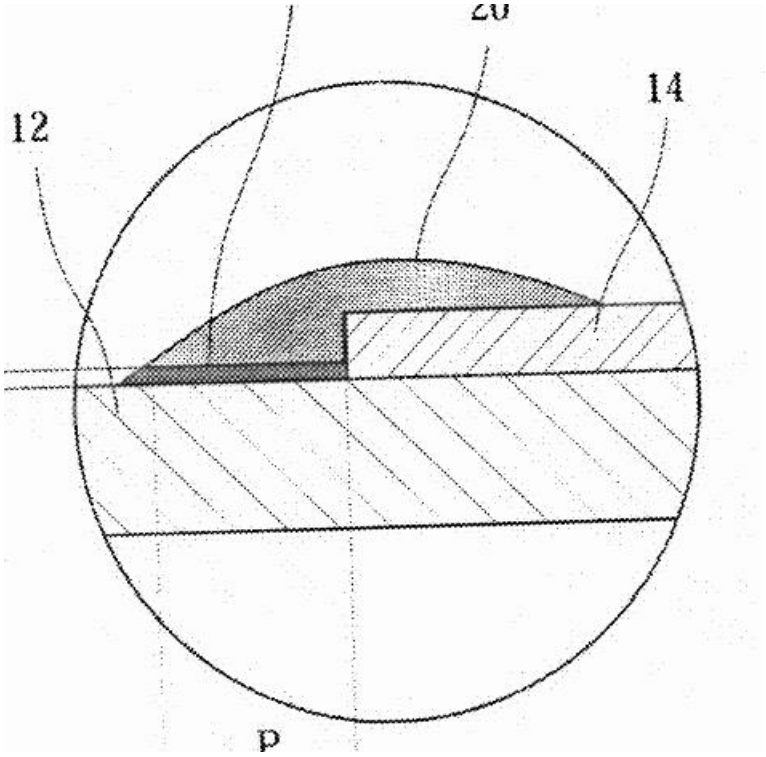
Joining of two substrates, where a substantial part of the joining material is present outside of the joint, leading to an outside joining of the joint

Definition statement

This place covers:

See for instance document US2010231129.





C04B 2290/00

Organisational aspects of production methods, equipment or plants

Special rules of classification

This scheme is associated mainly with groups C04B 2/00 - C04B 12/04 but also C04B 26/00 - C04B 32/00, C04B 38/00 and C04B 41/00