

C01B**NON-METALLIC ELEMENTS; COMPOUNDS THEREOF; {METALLOIDS OR COMPOUNDS THEREOF NOT COVERED BY SUBCLASS [C01C](#)}****Definition statement**

This place covers:

The chemical elements of hydrogen, halogen (fluorine, chlorine, bromine, iodine and astatine), oxygen, sulfur, phosphorus, silicon, nitrogen, boron, selenium, tellurium, and noble gases (helium, neon, argon, krypton, xenon and radon).

Compounds solely composed of any of the elements listed above.

Carbon and compounds of carbon with any of the elements listed above, with the proviso that said compounds cannot contain a carbon atom having direct bonding to another carbon atom, a carbon atom having direct bonding to a hydrogen atom or a halogen atom, or a carbon atom having direct bonding to a nitrogen atom by a single or double bond.

Compounds composed solely of one or more metal atoms and hydrogen.

Peroxides and salts of peroxyacids.

Magnesium, calcium, strontium, or barium sulfides or polysulfides.

Alkali metal sulfides or polysulfides.

Thiosulfates, dithionites and polythionates.

Compounds containing selenium or tellurium.

Azides, metal amides and nitrites.

Carbamic acid and salts thereof.

Binary compounds containing a metal and either N, C or P.

Salts of the oxyacids of halogen or phosphorus.

Compounds consisting only of carbon atoms, e.g. fullerenes, carbon nanotubes.

Phosgene and thiophosgene.

Compounds containing silicon such as silicates, silicon oxides or colloidal silica, e.g. dispersions, gels, hydroorganosols, organosols.

Compounds containing boron.

Substances having molecular sieve properties, but not having base-exchange properties.

Substances having a combination of molecular sieve and base-exchange properties, e.g. crystalline zeolites.

Synthesis, treatment or modification of any of the elements or compounds above by:

- chemical means, i.e. chemical reaction;
- physical means, e.g. concentration, dehydration, purification, separation, solidifying, granulation;
- addition of a stabilizer or preservative; or
- by the combination of chemical and physical means, with the proviso that the resultant product is proper for classification in this subclass.

Methods of preparing the following compounds, in general:

- halides;
- oxides or hydroxides;
- sulphides or polysulfides;
- sulfites;
- sulphates;
- nitrates; or
- carbonates or bicarbonates.

Apparatus:

- for preparation of sulfur trioxide or sulfuric acid by contact processes; or
- for preparation of nitric oxide by catalytic oxidation of ammonia or oxidation of nitrogen.

Relationships with other classification places

In Class [C01](#), in the absence of an indication to the contrary, a compound is classified in the last appropriate subclass of this class. For example, lead oxide is classified in subclass [C01G](#) rather than in this subclass.

This subclass is a function oriented entry for the chemical elements and their compounds and does not cover the application or use of the elements and compounds under the subclass definition. For classifying such information other entries in IPC exist, for example:

- Compounds or compositions for preservation of the bodies of humans, animals, plants, or parts thereof, e.g. disinfectants, pesticides, herbicides, as pest repellants or attractants, and as plant growth regulators are classified in subclass [A01N](#).
- Preparations for medical, dental, or toilet purposes are classified in subclass [A61K](#).

Salts, adducts, or complexes formed between an inorganic compound of this subclass and an organic compound of class [C07](#), are regarded as organic compounds and classified in class [C07](#).

When a process produces multiple compounds only those which are intended or desired require classification and classification may be proper in multiple subclasses.

MULTIPLE CLASSIFICATION

Biocidal, pest repellant, pest attractant, or plant growth regulatory activity of chemical compounds or preparations is further classified in [A01P](#).

Therapeutic activity of chemical compounds or medicinal preparations is further classified in subclass [A61P](#).

Uses of cosmetics or similar toilet preparations are further classified in subclass [A61Q](#).

References

Limiting references

This place does not cover:

Treatment of inorganic materials to enhance their pigmenting or filling properties; Preparation of carbon black	C09C
Intentional preparation of carbon dioxide by a fermentation process or the use of an enzyme	C12P 1/00
Preparation of elements or inorganic compounds except carbon dioxide, by a fermentation process or the use of an enzyme	C12P 3/00
Production of non-metallic elements or inorganic compounds by electrolysis or electrophoresis	C25B 1/00

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Processing powders of inorganic compounds preparatory to the manufacturing of ceramic products	C04B 35/00
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Informative references

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

Processes and apparatus in general for separation	B01D
Chemical or physical processes, e.g. catalysts, colloid chemistry; their relevant apparatus	B01J
Inorganic fertilisers	C05D
Organic chemistry	C07
Alloys	C22C
Chemical libraries containing only inorganic compounds or inorganic materials	C40B 40/18
Methods of creating chemical libraries	C40B 50/00

Special rules of classification

In this subclass, in the absence of an indication to the contrary, a compound or a process of making a compound appropriate for this subclass is classified in the last appropriate place.

This subclass provides for products which are intended or desired. When a process produces multiple compounds only those which are intended or desired require a classification. However, by-products can be given an additional classification if they or the processes for obtaining them are considered of interest for search.

Inorganic salts of a compound, unless specifically provided for elsewhere, are classified as that compound.

Glossary of terms

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

Base-exchange	The replacement of one cation absorbed on a material by another.
Binary compound	A compound containing and limited to two distinct chemical elements.
Direct bonding	Requires a bond between two adjacent atoms.

Inorganic compound	A compound devoid of a carbon atom and containing a non-metallic element, or a compound containing a carbon atom, and satisfying one of the following criteria: the compound cannot have a carbon atom having direct bonding to another carbon atom, or the compound cannot have direct bonding between a carbon atom and a halogen or hydrogen atom, or the compound cannot have direct bonding between a carbon and a nitrogen atom by a single or double bond. The following are exceptions to the above and are to be considered as inorganic compounds: compounds consisting of only carbon atoms, (e.g. fullerenes), cyanogen, cyanogen halides, cyanamide, phosgene, thiophosgene, hydrocyanic acid, isocyanic acid, isothiocyanic acid, fulminic acid, unsubstituted carbamic acid, and salts of the previously mentioned acids and which contain the same limitations as to a carbon atom.
Isomorphous zeolites	Compounds isomorphous to zeolites wherein the aluminum or silicon atoms in the framework are partly or wholly replaced by atoms of other elements, e.g. by gallium, germanium, phosphorus or boron.
Metal	Any element other than a non-metal.
Metal hydride	Compound containing only metal and hydrogen.
Molecular sieve	Materials (e.g. zeolitic, mesoporous) having cavities and channels which by their size allow some molecules to pass through, but prevent others.
Non-metal	The elements of hydrogen, carbon, halogen (fluorine, chlorine, bromine, iodine and astatine), oxygen, sulfur, phosphorus, silicon, nitrogen, boron, selenium, tellurium and noble gases (helium, neon, argon, krypton, xenon and radon).
Preparation	Covers synthesis, purification, separation, stabilisation, or use of additives, unless a separate place is provided in the classification scheme.
Zeolites	(i) Crystalline aluminosilicates with base-exchange and molecular sieve properties, having three dimensional, microporous lattice framework structure of tetrahedral oxide units; (ii) Compounds isomorphous to those of the former category, wherein the aluminium or silicon atoms in the framework are partly or wholly replaced by atoms of other elements, e.g. by gallium, germanium, phosphorus or boron.

C01B 3/00

Hydrogen; Gaseous mixtures containing hydrogen; Separation of hydrogen from mixtures containing it; Purification of hydrogen; Reversible storage of hydrogen (production of water-gas or synthesis gas from solid carbonaceous material [C10J](#))

References

Limiting references

This place does not cover:

Production of water gas or synthesis gas from solid carbonaceous material	C10J
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Informative references

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

Aspects relating to hydrogen or synthesis gas generation processes	C01B 2203/00
Separation of gases by physical means	B01D
Chemical or physical processes in general, conducted in the presence of fluids and solid particles; Apparatus for such processes	B01J 8/00
Chemical, physical or physico-chemical processes in general; Apparatus for such processes	B01J 19/00
Storing fluids in natural or artificial cavities or chambers in the earth	B65G 5/00
Purifying or modifying the chemical compositions of combustible technical gases containing carbon monoxide	C10K
Fermentation or enzyme-using processes to synthesise a desired chemical compound or composition or to separate optical isomers from a racemic mixture	C12P
Electrolytic production of hydrogen	C25B 1/02
Vessels for containing or storing compressed, liquefied or solidified gases; Fixed-capacity gas-holders; Filling vessels with, or discharging from vessels, compressed liquefied or solidified gases	F17C
Pipe-line systems; Pipe-lines	F17D

Special rules of classification

In groups [C01B 3/0005](#) - [C01B 3/0084](#), the last place priority rule is not applied. The material and the form of uptaking media should be classified.

In this group, symbols of indexing groups [B01J 2208/00](#) and [B01J 2219/00](#) should be added for details relating to the reactors used in the generation of hydrogen or synthesis gas.

C01B 3/001

characterised by the uptaking media; Treatment thereof

Special rules of classification

In all of the groups [C01B 3/0026](#) - [C01B 3/0084](#), the metallic storage materials may contain minor quantities of non-metals such as B, C, O, S, Se, Si; e.g. [C01B 3/0036](#) "only containing iron and titanium" includes Fe-Ti compositions comprising a minor quantity of non-metals.

Glossary of terms

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

Rare-earth metal	one single metal or a combination of metals selected from the lanthanides, Sc or Y.
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C01B 3/0015

Organic compounds, e.g. liquid organic hydrogen carriers [LOHC] or metalorganic compounds; Solutions thereof

Definition statement

This place covers:

Reversible uptake of hydrogen characterised by the uptaking medium being organic compounds, solutions thereof, e.g. metal organic frameworks

C01B 3/0084

Solid storage media characterised by their shape, e.g. porous compacts or hollow particles

Definition statement

This place covers:

Reversible uptake of hydrogen characterised by the shape of the solid storage uptaking medium, e.g. hydrogen storage in glass beads amongst others.

C01B 3/025

Preparation or purification of gas mixtures for ammonia synthesis

References**Informative references**

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

Integration of a hydrogen producing process with ammonia synthesis.	C01B 2203/068
Preparation or separation of ammonia.	C01C 1/02

C01B 3/04

**by decomposition of inorganic compounds (reversible storage of hydrogen
[C01B 3/0018](#))**

References**Limiting references**

This place does not cover:

Reversible storage of hydrogen by inorganic elements or compounds, e.g. oxides, nitrides, borohydrides or zeolites; Solutions thereof	C01B 3/0018
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Glossary of terms

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

decomposition	only one reactant involved
reaction	at least two reactants involved

C01B 3/06

by reaction of inorganic compounds containing electro-positively bound hydrogen with inorganic reducing agents

Glossary of terms

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

decomposition	only one reactant involved
reaction	at least two reactants involved
silicon	metalloid (group 14)

C01B 3/08

by reaction of inorganic compounds with metals

Glossary of terms

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

metals	pure metals or metal alloys. Metal hydrides or metal oxides are not covered by this term.
silicon	metalloid (group 14)

C01B 3/10

by reaction of water vapour with metals

Glossary of terms

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

metals	pure metals or metal alloys. Metal hydrides or metal oxides are not covered by this term.
silicon	metalloid (group 14)

C01B 3/22

by decomposition of gaseous or liquid organic compounds

Definition statement

This place covers:

Production of hydrogen or gaseous mixtures containing hydrogen by decomposition of gaseous or liquid organic compounds or by an incomplete decomposition.

For example, a dehydrogenation specifically meant for the production of hydrogen will also be classified in this group.

References

Informative references

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

Coking liquid carbonaceous materials	C10B 55/00
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Synonyms and Keywords

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

- "decomposition", "cracking" and "pyrolysis"

C01B 3/32

by reaction of gaseous or liquid organic compounds with gasifying agents, e.g. water, carbon dioxide or air

Special rules of classification

If the documents does not specify the type of gaseous or liquid organic compound further and if it is not mentioned whether a catalyst is used, classify in [C01B 3/32](#).

If it concerns a catalytic process, but if the type of gaseous or liquid organic compound is not further specified, then classify in [C01B 3/38](#) and subgroups or in [C01B 3/40](#).

C01B 3/326

characterised by the catalysts

Definition statement

This place covers:

Production of hydrogen or of gaseous mixtures containing hydrogen by catalytic reaction of gaseous or liquid organic compounds other than hydrocarbons with gasifying agents characterised by the catalyst.

References

Informative references

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

Catalysts	B01J 21/00 - B01J 38/00
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C01B 3/382

Processes with two or more reaction steps, of which at least one is catalytic, e.g. steam reforming and partial oxidation

Definition statement

This place covers:

Multi-step process for the production of hydrogen or gaseous mixtures containing hydrogen by catalytic reaction of hydrocarbons with gasifying agents, including autothermal reforming.

References

Informative references

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

Chemical or physical processes in general, conducted in the presence of fluids and solid particles; Apparatus for such processes, e.g. apparatus for autothermal reforming	B01J 8/00
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Glossary of terms

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

catalytic multi-step process	a catalytic multi-step process that generates a hydrogen-containing gas from a hydrocarbon, including at least one catalytic step
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C01B 3/384

with external heating of the catalyst

Relationships with other classification places

Chemical or physical processes in general and their relevant apparatus are classified in [B01J](#)

Special rules of classification

This class is only to be allocated when the external heating is explicitly mentioned.

C01B 3/40

characterised by the catalyst

Definition statement

This place covers:

Production of hydrogen or gaseous mixtures containing hydrogen by catalytic reaction with gasifying agents characterised by the catalyst.

References

Informative references

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

Catalysts	B01J 21/00 - B01J 38/00
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C01B 3/508

by using hydrogen storage media (reversible storage of hydrogen [C01B 3/0005](#))

Definition statement

This place covers:

This group covers separation or purification processes in which hydrogen or the hydrogen-containing gas is removed from the gaseous mixtures.

References

Limiting references

This place does not cover:

Reversible uptake of hydrogen by an appropriate medium	C01B 3/0005
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Informative references

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

Separation of hydrogen or hydrogen-containing gases from gaseous mixtures by contacting with solids	C01B 3/56
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C01B 3/56

by contacting with solids; Regeneration of used solids

Definition statement

This place covers:

The removal of one or more impurities from hydrogen or hydrogen-containing gases by contact with solids, or the regeneration of the used solids.

References

Informative references

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

Removal of hydrogen or hydrogen-containing gas from the gaseous mixture by selective and reversible uptake by an appropriate medium	C01B 3/508
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C01B 4/00

Hydrogen isotopes; Inorganic compounds thereof prepared by isotope exchange, e.g. $\text{NH}_3 + \text{D}_2 \rightarrow \text{NH}_2\text{D} + \text{HD}$

References

Informative references

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

Separation of isotopes	B01D 59/00
Other chemical reactions to form compounds of hydrogen isotopes	C01

C01B 5/00

Water

Definition statement

This place covers:

This group only covers documents directed to the preparation of water, water being the product.

References

Limiting references

This place does not cover:

Arrangement of installations for producing fresh water, e.g. by evaporation and condensation of sea water.	B63J 1/00
Treatment of water	C02F
Fuel cell (production of electricity with water as side product)	H01M 8/00

C01B 6/00

Hydrides of metals {including fully or partially hydrided metals, alloys or intermetallic compounds (use of some thereof for reversible sorption of hydrogen [C01B 3/0005](#), [C01B 3/508](#)); Compounds containing at least one metal-hydrogen bond, e.g. $(\text{GeH}_3)_2\text{S}$, SiH GeH }; Monoborane or diborane; Addition complexes thereof (higher hydrides of boron, substituted hydrides of boron [C01B 35/00](#))

Definition statement

This place covers:

This group covers documents, in which metal hydrides are claimed per se and documents, in which the preparation of metal hydrides is disclosed.

References

Informative references

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

Reversible uptake of hydrogen by an appropriate medium	C01B 3/0005
Higher hydrides of boron than monoborane or diborane, substituted hydrides of boron	C01B 35/00

Glossary of terms

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

Metal hydride	Compound containing only metal or metal alloy and hydrogen.
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C01B 7/00

Halogens; Halogen acids (oxyacids [C01B 11/00](#))

References

Limiting references

This place does not cover:

Oxyacids of halogens and salts thereof	C01B 11/00
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C01B 9/00

General methods of preparing halides (particular individual halides, see the relevant groups in [C01B](#) - [C01G](#) according to the element combined with the halogen; electrolytic production of inorganic compounds [C25B](#))

References**Limiting references**

This place does not cover:

Electrolytic production of inorganic compounds	C25B
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Special rules of classification

Particular individual halides according to the element combined with the halogen are classified in the relevant groups [C01B](#) - [C01G](#).

C01B 11/00

Oxides or oxyacids of halogens; Salts thereof

Definition statement

This place covers:

Oxides or oxyacids of halogens or salts thereof when claimed as such and the preparation thereof.

C01B 13/00

Oxygen; Ozone; Oxides or hydroxides in general

Definition statement

This place covers:

The preparation of oxygen, ozone, oxides and hydroxides.

References**Informative references**

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

Use or ozone for disinfecting	A61L
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C01B 13/02

Preparation of oxygen (by liquefying [F25J](#))

References**Informative references**

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

Enrichment of a gaseous mixture, in particular air, in oxygen or separation of oxygen from a gaseous mixture by an adsorption process	B01D63/03
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Enrichment of a gaseous mixture, in particular air, in oxygen or separation of oxygen from a gaseous mixture by liquefying	F25J
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C01B 13/0229

{Purification or separation processes}

Definition statement

This place covers:

Purification and separation processes related to the production of oxygen

References

Informative references

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

Processes and apparatus in general for separation	B01D
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Special rules of classification

In groups [C01B 13/0229](#) - [C01B 13/0288](#), additional features relating to the purification or separation processes are indexed with symbols chosen from [C01B 2210/0026](#) - [C01B 2210/0098](#).

C01B 13/0288

{Combined chemical and physical processing}

References

Informative references

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

Processes and apparatus in general for separation	B01D
Chemical or physical processes, e.g. catalysts, colloid chemistry; their relevant apparatus	B01J

Special rules of classification

In this group, processing steps are also classified with symbols chosen from [C01B 2210/0001](#) - [C01B 2210/0025](#).

C01B 13/10

Preparation of ozone

Special rules of classification

When ozone is produced by generation of a plasma, the document is classified in [C01B 13/10](#) and not in [C01B 13/11](#).

C01B 13/11

by electric discharge

Relationships with other classification places

Process for preparation of ozone and its apparatus are classified in [C01B 13/11](#) subgroups.

Devices for providing corona discharge are classified in [H01T 19/00](#) subgroups.

Process for preparation of ozone by ultraviolet light, the apparatus is also classified in [B01J 19/123](#)

Special rules of classification

When ozone is produced by generation of a plasma, the document is classified in [C01B 13/10](#) and not in [C01B 13/11](#).

In groups [C01B 13/11](#) and [C01B 13/115](#), additional features relating to the preparation of ozone by electrical discharge are classified with symbols chosen from [C01B 2201/00](#) - [C01B 2201/90](#).

C01B 13/14

Methods for preparing oxides or hydroxides in general (particular individual oxides or hydroxides, see the relevant groups of subclasses [C01B](#) - [C01G](#) or [C25B](#), according to the element combined with the oxygen or hydroxy group)

Definition statement

This place covers:

Methods for preparing (hydr)oxides in general, not specific to a particular (hydr)oxide

Relationships with other classification places

Particular individual oxides or hydroxides are classified in the relevant groups of subclasses [C01B](#) - [C01G](#) or [C25B](#), according to the element combined with the oxygen or hydroxy group

References

Limiting references

This place does not cover:

Generic features dealing with the preparation of (hydr)oxides of sodium, potassium or alkali metals	C01D 1/00
Generic features dealing with the preparation of (hydr)oxides of metals not covered by C01B , C01D or C01F	C01G 1/02
Preparation of (hydr)oxides by electrolysis	C25B 1/00

Special rules of classification

Contrary to the strict interpretation of the wording of the groups of [C01](#) does this group dealing with the preparation of (hydr)oxides also comprise the after-treatment ([C01B 13/145](#)) and the purification ([C01B 13/16](#)).

C01B 13/145

{After-treatment of oxides or hydroxides, e.g. pulverising, drying, decreasing the acidity}

References**Limiting references**

This place does not cover:

The after treatment of oxides for improving the pigmenting or filling properties:	C09C 1/00
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C01B 13/16**Purification****Definition statement**

This place covers:

All methods for purification of oxides or hydroxides in general

References**Limiting references**

This place does not cover:

The purification of specific oxides (see the relevant class of [C01D-C01G](#)), e.g.:

Of aluminium (hydr)oxides:	C01F 7/46
Of calcium, strontium or barium oxides:	C01F 11/16

Informative references

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

Processes and apparatus in general for separation	B01D
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Special rules of classification

The purity of compounds in solid compounds in [C01](#) is also covered by the group [C01P 2006/80](#)

C01B 13/18**by thermal decomposition of compounds, e.g. of salts or hydroxides****Definition statement**

This place covers:

The decomposition by application of heat without the addition of other reactants. Starting solutions can be sprayed but the obtained dried precursor is subsequently in a separate step decomposed by heat.

References

Limiting references

This place does not cover:

The one-step conversion of sprayed or atomized solutions	C01B 13/34
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C01B 13/20

by oxidation of elements in the gaseous state; by oxidation or hydrolysis of compounds in the gaseous state

Definition statement

This place covers:

The oxidation or hydrolysis of metal (oxy)halides only.

C01B 13/32

by oxidation or hydrolysis of elements or compounds in the liquid or solid state {or in non-aqueous solution, e.g. sol-gel process}

Definition statement

This place covers:

The oxidation or hydrolysis of (e.g. organic) metal compounds, in pure form ('in the liquid state' in subgroup [C01B 13/326](#)) or dissolved in a non-aqueous (e.g. alcohol) solution ('in solution'). The 'sol-gel process' is classified in here.

References

Limiting references

This place does not cover:

Precipitation reactions in aqueous solutions:	C01B 13/36
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C01B 13/34

by oxidation or hydrolysis of sprayed or atomised solutions

References

Limiting references

This place does not cover:

Processes whereby after spraying a precursor is obtained (e.g. a salt) which is subsequently decomposed into the oxide in a separate furnace:	C01B 13/18
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C01B 13/36

by precipitation reactions in {aqueous} solutions {(C01B 13/328 takes precedence)}

Definition statement

This place covers:

Precipitation reactions, e.g. from a metal salt by adding a base like NaOH or NH₃

References**Limiting references**

This place does not cover:

Groups comprises reactions in non-aqueous solutions. Hydrolysis of (organic) starting materials in e.g. alcohols by the sol-gel process, see [C01B 13/32](#).

C01B 13/363

{Mixtures of oxides or hydroxides by precipitation}

Definition statement

This place covers:

Mixtures of oxides or hydroxides including mixed (hydr)oxides, i.e. plural metal oxides or hydroxides and also mixtures of metal oxides and hydroxides

C01B 13/366

{by hydrothermal processing}

Definition statement

This place covers:

Processes whereby a pressure above one bar is realised by heating an aqueous solution above 100°C in a closed container (autoclave).

Synonyms and Keywords

Closed reaction container	autoclave
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C01B 15/00

Peroxides; Peroxyhydrates; Peroxyacids or salts thereof; Superoxides; Ozonides

Definition statement

This place covers:

Peroxides, peroxyhydrates, peroxyacids and salts thereof, superoxides and ozonides when claimed as such and the preparation processes thereof.

C01B 17/00**Sulfur; Compounds thereof****Definition statement**

This place covers:

Compositions consisting of elemental sulfur or of sulfur compounds as far as not classified in groups following [C01B 17/98](#) according to the other elements (like transition metals) present. This groups includes preparations of such compositions as well as after-treatments in general, thus in so far these are not limited to one specific application. Also included are apparatus specially adapted to the preparation.

C01B 17/02**Preparation of sulfur; Purification****Definition statement**

This place covers:

Preparation of elemental sulfur only.

C01B 17/021**{Separation of sulfur from gases}****References****Limiting references**

This place does not cover:

As part of the Claus process:	C01B 17/0447
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Informative references

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

Processes and apparatus in general for separation	B01D
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C01B 17/0221**{Melting}****Definition statement**

This place covers:

e.g. block melting

C01B 17/0232**{Purification, e.g. degassing}****Definition statement**

This place covers:

All types of removal of all kind of impurities irrespective the source of the sulfur.

References**Limiting references***This place does not cover:*

Purification of sulfur obtained from materials comprising elemental sulfur:	C01B 17/027
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Informative references*Attention is drawn to the following places, which may be of interest for search:*

Processes and apparatus in general for separation	B01D
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C01B 17/0237**{Converting into particles, e.g. by granulation, milling}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Granulation in general	B01J 2/00
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C01B 17/0253**{from non-gaseous sulfur compounds other than sulfides or materials containing such sulfides}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Sulfur from H ₂ S or H ₂ S-containing gases:	C01B 17/04
Sulfur from SO ₂ or SO ₂ -containing gases:	C01B 17/0473

C01B 17/027**Recovery of sulfur from material containing elemental sulfur, e.g. luxmasses {or sulfur containing ores}; Purification {of the recovered sulfur}****References****Limiting references***This place does not cover:*

Purification of sulfur in general or obtained by other methods:	C01B 17/0232
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C01B 17/04**from gaseous sulfur compounds including gaseous sulfides****Definition statement***This place covers:*All process whereby the sulfur source is a gaseous sulfur compound, e.g. H₂S, SO₂**References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Catalytic removal of sulfur compounds from gas streams in general:	B01D 53/8603
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C01B 17/0404**{by processes comprising a dry catalytic conversion of hydrogen sulfide-containing gases, e.g. the Claus process}****Definition statement***This place covers:*

- This subgroup covers also other processes than the Claus process.
- This group includes also specific steps not classifiable in the subgroups [C01B 17/0408](#) - [C01B 17/0469](#) according to the characterising features of these steps, e.g. heat exchangers not being part of a combustion furnace.
- Features which relate to several separate steps of the Claus process are classified in [C01B 17/0404](#), e.g. parts of flow sheets (like gas lines connecting separate steps).

References**Limiting references***This place does not cover:*

Obtaining sulfur from gaseous compounds by wet processing:	C01B 17/05
Processes for the removal of H ₂ S from gas streams whereby the H ₂ S is present as an impurity:	B01D 53/8603

Special rules of classification

- Features relating to specific steps of the Claus process are classified in the subgroups [C01B 17/0408](#)-[C01B 17/0456](#).
- Specific steps not classifiable in the subgroups according to the characterising features of these steps (e.g. heat exchangers not being part of a combustion furnace) are classified in [C01B 17/0404](#).
- Features which relate to several separate steps of the Claus process are classified in [C01B 17/0404](#), e.g. details of flow sheets (like gas lines connecting separate steps).

C01B 17/0408**{Pretreatment of the hydrogen sulfide containing gases}****Definition statement***This place covers:*

All kind of operations applied to the feed gas, e.g. concentration by absorption, adsorption or purification (removal of non-sulfur components).

C01B 17/0413**{characterised by the combustion step}****Definition statement***This place covers:*

E.g. the thermal step of the Claus process.

C01B 17/0417**{Combustion reactors}****Definition statement***This place covers:*

Only constructional features of the reactor, including waste heat boilers and the like connected therewith.

References**Informative references**

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

Reactors in general:	B01J 8/00
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Glossary of terms

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

Combustion reactor	thermal Claus furnace
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C01B 17/0421**{Multistage combustion}****Definition statement***This place covers:*

Only multi-combustion in two separate furnaces.

Special rules of classification

Two oxidizer gas flows to one single reactor is classified in [C01B 17/0413](#) (or [C01B 17/0417](#) when it concerns the reactor).

C01B 17/043**{Catalytic converters}****References****Informative references**

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

Chemical or biological purification of engine exhaust gases	B01D 53/00
Reactors in general	B01J 8/00
Exhaust apparatus having means for purifying exhaust gases	F01N 3/00

C01B 17/0434**{Catalyst compositions}****Definition statement**

This place covers:

The compositions are considered to include supports.

References**Informative references**

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

Catalytic compositions in general:	B01J
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Special rules of classification

Mechanical adaptations of the catalytic reactor for comprising the catalyst are classified in [C01B 17/043](#).

C01B 17/0439**{at least one catalyst bed operating below the dew-point of sulfur}****Definition statement**

This place covers:

- All those processes whereby sulfur (liquid or solid) remains in or at the catalyst. This group comprises also measures for the regeneration of the sulfur-loaded catalyst.
- E.g. CBA (Cold Bed Absorption), MCRC (Maximum Claus Recovery Concept), Sulfreen or Maxisulf.
- Clinsulf can also be operated at sub-dew point conditions.

C01B 17/0443**{in a moving bed}****Glossary of terms***In this place, the following terms or expressions are used with the meaning indicated:*

Moving bed	e.g. fluidized bed
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C01B 17/0447**{Separation of the obtained sulfur}****Definition statement***This place covers:*

Measures dealing with the separation of the elemental sulfur after one or more of the separate steps of e.g. the Claus process.

References**Limiting references***This place does not cover:*

Purification of the separated sulfur	C01B 17/0232
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C01B 17/0452**{Process control; Start-up or cooling-down procedures of the Claus process}****Definition statement***This place covers:*

E.g. adjustment of ratio of gas stream components.

C01B 17/0456**{the hydrogen sulfide-containing gas being a Claus process tail gas}****Definition statement***This place covers:*

Those processes whereby the tail gas from a Claus process plant are reused for obtaining sulfur, e.g. by concentration of H₂S or reduction of SO₂ present in the tail gas.

References**Limiting references***This place does not cover:*

Removal of sulfur compounds from Claus tail gases without obtaining elemental sulfur:	B01D 53/8603
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C01B 17/046**{without intermediate formation of sulfur dioxide}****Definition statement***This place covers:*

- These processes are also indicated as selective oxidation or direct oxidation of H₂S.
- E.g. 'Superclaus'-processes comprising thermal and catalytic Claus steps combined with a selective oxidation step.

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

Without intermediate formation of sulfur	selective oxidation or direct oxidation
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C01B 17/0465**{Catalyst compositions}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Catalysts in general:	B01J
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C01B 17/0469**{at least one catalyst bed operating below the dew-point of sulfur}****Definition statement***This place covers:*

E.g. Clauspol process.

References**Limiting references***This place does not cover:*

Subdew-point process as part of the Claus process:	C01B 17/0439
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C01B 17/0473**{by reaction of sulfur dioxide or sulfur trioxide containing gases with reducing agents other than hydrogen sulfide}****Definition statement***This place covers:*Reaction of SO₂ or SO₃ with all kind of reducing agents, gaseous, liquid or solid.

C01B 17/0478**{with hydrocarbons or mixtures containing them}****Definition statement***This place covers:*Reduction of SO₂, e.g. with natural gas.**C01B 17/0495****{by dissociation of hydrogen sulfide into the elements}****Special rules of classification**Classification is also accomplished in [C01B 3/04](#) because of the produced hydrogen.**C01B 17/05****by wet processes****Definition statement***This place covers:*

- This group comprises all processes comprising a liquid step, independent of the character of the liquid.
- E.g. iron chelate processes.

References**Limiting references***This place does not cover:*

Removal of sulfur compounds from gases without obtaining elemental sulfur	B01D 53/52
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C01B 17/06**from non-gaseous sulfides or materials containing such sulfides, e.g. ores****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Preparation of sulfur from sulfates	C01B 17/0253
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C01B 17/16**Hydrogen sulfides****Definition statement***This place covers:*

Preparation, separation or purification of binary hydrogen-sulfur compounds.

C01B 17/164**{Preparation by reduction of oxidic sulfur compounds}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

The preparation of elemental sulfur from SO ₂ or SO ₃	C01B 17/0473
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C01B 17/167**{Separation}****Definition statement***This place covers:*Recovery of H₂S from gas streams.**References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Processes and apparatus for separation in general	B01D
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C01B 17/168**{Purification}****Definition statement***This place covers:*Removal of all kind of impurities (gaseous, liquid or solid) from H₂S.**References****Limiting references***This place does not cover:*

The removal of large amounts of components qualified as impurities is regarded to represent a separation of H ₂ S from that gas stream (e.g. 70% impurity, 30% H ₂ S) and is classified in	C01B 17/167
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C01B 17/18**Hydrogen polysulfides****Definition statement***This place covers:*All compounds H₂S_{1+x}, wherein x>0

C01B 17/20

Methods for preparing sulfides or polysulfides, in general (ammonium sulfides or polysulfides [C01C](#); sulfides or polysulfides of metals, other than alkali metals, magnesium, calcium, strontium and barium, see the relevant groups of subclasses [C01F](#) or [C01G](#), according to the metal)

Definition statement

This place covers:

Methods for preparing sulfided or polysulfides in general, not specific to the chemical nature of the (poly)sulfide.

Relationships with other classification places

- Ammonium (poly)sulfides: [C01C 1/20](#)
- Methods relating to one specific metal sulfide are classified according to the metal: [C01D](#), [C01F](#) or [C01G](#)

Special rules of classification

All documents in this group and its subgroups are classified in the [C01P](#) subgroups

C01B 17/22**Alkali metal sulfides or polysulfides****Special rules of classification**

All documents in this group and its subgroups are classified in the [C01P](#) subgroups

Glossary of terms

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

Polysulfides	all compounds $\text{Me}_2\text{S}_{1+x}$, with $x>0$
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C01B 17/34**Polysulfides of sodium or potassium****Definition statement**

This place covers:

All compounds $\text{Me}_2\text{S}_{1+x}$, with $x>0$, $\text{Me}=\text{Na}, \text{K}$

Glossary of terms

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

Polysulfides	All compounds $\text{Me}_2\text{S}_{1+x}$, with $x>0$, $\text{Me}=\text{Na}, \text{K}$
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C01B 17/42**Sulfides or polysulfides of magnesium, calcium, strontium, or barium****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Sulfates of these metals	C01F 11/46
Sulfites of these metals:	C01F 11/48

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

Polysulfides:	all compounds MeS_{1+x} , with $x > 0$
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C01B 17/45**Compounds containing sulfur and halogen, with or without oxygen****Special rules of classification**All documents in this group and its subgroups are indexed according to the [C01P](#)-scheme**C01B 17/48****Sulfur dioxide; Sulfurous acid****Definition statement***This place covers:* SO_2 and H_2SO_3 **C01B 17/50****Preparation of sulfur dioxide****Definition statement***This place covers:*

Process for the preparation and apparatus specifically adapted therefor.

C01B 17/504**{of ammonium sulfates (of ammonium sulfates containing sulfuric acid solutions [C01B 17/585](#))}****References****Limiting references***This place does not cover:*

Starting from ammonium sulfates containing sulfuric acid	C01B 17/585
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C01B 17/52

by roasting sulfides (preliminary treatment of ores or scrap [C22B 1/00](#))

References**Limiting references**

This place does not cover:

Preliminary treatment of ores	C22B 1/00
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C01B 17/54

by burning elemental sulfur

Definition statement

This place covers:

All combustion processes sulfur, as solid, liquid or gas

References**Informative references**

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

Burners in general	F23D 14/00
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Special rules of classification

Processes comprising the combustion of sulfur followed by the oxidation of SO₂ into SO₃ are classified according to the step which makes the contribution over the prior art. A (further not specified) burning of sulfur with a specific oxidation catalyst is classified in [C01B 17/78](#). A well defined burning step with a common oxidation into SO₃ is classified in [C01B 17/54](#). In case both steps make the invention is the document classified in both groups.

C01B 17/56

Separation; Purification

Definition statement

This place covers:

Preparation of sulfur dioxide by separation, purification.

References**Informative references**

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

Processes and apparatus in general for separation	B01D
Chemical or physical processes, e.g.sulfur removal form a waste gas	B01J

Special rules of classification

See also [C01B 17/60](#)

C01B 17/60**Isolation of sulfur dioxide from gases****Special rules of classification**See also [C01B 17/56](#)**C01B 17/62****Methods of preparing sulfites in general (particular individual sulfites, see the relevant groups of subclasses [C01B](#) - [C01G](#), according to the cation)****Definition statement***This place covers:*

Methods of preparing sulfites in general and not specific to the chemical nature of the sulfite.

References**Limiting references***This place does not cover:*

Specific sulfites are classified according to the metal	C01B , C01D , C01E , C01G
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C01B 17/625**{metabisulfites or pyrosulfites}****Glossary of terms***In this place, the following terms or expressions are used with the meaning indicated:*

Metabisulfites or pyrosulfites	S 2O 52-
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C01B 17/64**Thiosulfates; Dithionites; Polythionates****Glossary of terms***In this place, the following terms or expressions are used with the meaning indicated:*

Thiosulfates	S 2O 32-
Ithionites (=hydrosulfites)	S 2O 42-

C01B 17/66**Dithionites {or hydrosulfites ($S_2O_4^{2-}$)}****Glossary of terms***In this place, the following terms or expressions are used with the meaning indicated:*

Dithionites (=hydrosulfites)	S 2O 42-
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C01B 17/69**Sulfur trioxide; Sulfuric acid****Definition statement**

This place covers:

All features in relation to SO₃ or H₂SO₄ not classifiable in the subgroups of [C01B 17/69](#).

C01B 17/74**Preparation****Definition statement**

This place covers:

All documents dealing with preparative features not classifiable in the subgroups of [C01B 17/74](#).

C01B 17/76**by contact processes****Definition statement**

This place covers:

All catalytic processes for the oxidation of SO₂ into SO₃. This group comprises features not classifiable in the subgroups of [C01B 17/76](#).

In the contact processes the contact is the catalyst (a solid), it's then a gas/gas reactions in presence of a solid.

References**Informative references**

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

Processes and apparatus in general for separation	B01D
Chemical or physical processes	B01J

C01B 17/765**Multi-stage SO₃-conversion****Definition statement**

This place covers:

All conversion which includes more than one catalyst bed ('contact'), irrespective of whether they are present in one convertor or in several convertors.

C01B 17/7655**{with intermediate absorption}****Definition statement***This place covers:*

All processes where in addition to the final absorber at least one other SO₃-absorption is present between the catalytic beds.

C01B 17/901

{Recovery from spent acids containing metallic ions, e.g. hydrolysis acids, pickling acids (obtaining sulfur dioxide as an intermediate in sulfur trioxide recovery from sulfates, e.g. iron sulfates [C01B 17/501](#), from spent acids [C01B 17/58](#))}

Definition statement*This place covers:*

The presence in the starting solution of metallic ions is essential

References**Limiting references***This place does not cover:*

From sulfates whereby SO ₂ is obtained	C01B 17/501
From spent acids	C01B 17/58

C01B 17/902**{by dialysis}****Special rules of classification**

Removal of some specific impurities are classified in [C01B 17/905-C01B 17/908](#).

C01B 17/903**{by liquid-liquid extraction}****Special rules of classification**

Removal of some specific impurities are classified in [C01B 17/905-C01B 17/908](#).

C01B 17/904**{by ion-exchange}****Relationships with other classification places**

Separating processes in general involving the treatment of liquids with ion exchange materials as adsorbents are classified in **B01D15/04**

Special rules of classification

Removal of some specific impurities are classified in [C01B 17/905-C01B 17/908](#).

C01B 17/905**{Removal of organic impurities}****Definition statement**

This place covers:

Purification of sulfuric acid in which the impurity is present.

Special rules of classification

See also [C01B 17/92](#) in case of a mixture of acid and organic compounds.

C01B 17/96

Methods for the preparation of sulfates in general (particular individual sulfates, see the relevant groups of subclasses [C01B](#) - [C01G](#), according to the cation)

Definition statement

This place covers:

Methods for the preparation of sulfates in general, and not specific to the chemical nature of the sulfate.

References**Limiting references**

This place does not cover:

Processes or apparatus for the preparation of specific sulfates are classified according to the metal ion	C01B , C01D , C01E , C01G
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C01B 17/965**{Pyrosulfates}****Glossary of terms**

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

Pyrosulfate	2O 72-
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C01B 17/98

Other compounds containing sulfur and oxygen (persulfuric acids [C01B 15/06](#); persulfates [C01B 15/08](#))

References**Limiting references**

This place does not cover:

Persulfuric acid	C01B 15/06
Persulfates	C01B 15/08

C01B 19/00

Selenium; Tellurium; Compounds thereof (phosphorus compounds [C01B 25/14](#))

References**Limiting references**

This place does not cover:

Compounds containing also phosphorous	C01B 25/14
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Special rules of classification

All documents in this group and its subgroups (so [C01B 19/00](#) - [C01B 19/04](#)) are classified with symbols chosen from [C01P](#)-subgroups

C01B 19/002

{Compounds containing, besides selenium or tellurium, more than one other element, with -O- and -OH not being considered as anions}

Definition statement

This place covers:

The compounds classified in this group do have more than one element other than Se or Te, O and H not taken into account. The compounds with only one other element do find classification in the subgroups of this group.

References**Limiting references**

This place does not cover:

Compounds of Se or Te with only one other element, O and H not taken into account	C01B 19/004 - C01B 19/04
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C01B 19/007

{Tellurides or selenides of metals ([C01B 19/002](#) takes precedence)}

References**Limiting references**

This place does not cover:

Compounds of Se or Te with more than one metal or other element, except O or H	C01B 19/002
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C01B 19/02

Elemental selenium or tellurium

Definition statement

This place covers:

This group comprises also mixtures of Se and Te.

C01B 19/04

Binary compounds {including binary selenium-tellurium compounds ([C01B 19/004](#), [C01B 19/005](#), [C01B 19/007](#) take precedence)}

References**Limiting references**

This place does not cover:

Oxides or hydroxides of Se or Te	C01B 19/004
Halides of Se or Te	C01B 19/005
Tellurides or selenides of metals	C01B 19/007

C01B 21/00

Nitrogen; Compounds thereof

Definition statement

This place covers:

All compounds of nitrogen insofar they are not classified according to the last place rule to groups after [C01B 21/50](#), namely in [C01C](#), [C01D](#), [C01F](#) or [C01G](#).

C01B 21/02

Preparation of nitrogen (by decomposition of ammonia [C01B 3/047](#))

Definition statement

This place covers:

Obtaining nitrogen by preparation or synthesis.

References

Limiting references

This place does not cover:

Obtaining nitrogen by decomposition of ammonia	C01B 3/047
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Informative references

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

Separation of nitrogen from gas mixtures, e.g. air	C01B 21/04
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C01B 21/04

Purification or separation of nitrogen (by liquefying [F25J](#))

Relationships with other classification places

All purifications or gas separations involving a liquefaction step: [F25J](#)

References

Limiting references

This place does not cover:

Obtaining nitrogen by liquefaction or rectification	F25J 3/0257
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C01B 21/0405

{Purification or separation processes}

References

Limiting references

This place does not cover:

Obtaining oxygen by separation	C01B 13/0229
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Informative references

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

Gas separation in general:	B01D 53/00
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Special rules of classification

During classification are additional features classified using the groups [C01B 2210/00](#)-[C01B 2210/0098](#) . Example of such features is the type of impurity removed ([C01B 2210/0043](#)).

C01B 21/0411**{Chemical processing only}****Definition statement***This place covers:*

Those processes comprising only chemical methods as e.g. specified by the subgroups [C01B 21/0416](#)- [C01B 21/0427](#).

C01B 21/0416**{by oxidation}****Definition statement***This place covers:*

Chemical oxidation processes such as the removal of hydrogen by addition of oxygen to the feed gas. The impurity is oxidized.

C01B 21/0422**{by reduction}****Definition statement***This place covers:*

Chemical reduction processes such as the removal of oxygen by addition of a reducing agent, like hydrogen. The impurity is reduced.

C01B 21/0433**{Physical processing only}****Definition statement***This place covers:*

Those processes comprising only physical methods as e.g. specified by the subgroups [C01B 21/0438](#)- [C01B 21/0488](#).

C01B 21/0438**{by making use of membranes}****References****Informative references**

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

Membranes as such:	B01D 61/00 - B01D 71/00
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Synonyms and Keywords

Pressure swing absorption	PSA
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C01B 21/0455**{characterised by the adsorbent}****References****Limiting references***This place does not cover:*

Solid sorbents compositions per se	B01J 20/00
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C01B 21/0477**{Temperature swing adsorption}****Glossary of terms***In this place, the following terms or expressions are used with the meaning indicated:*

TSA	temperature swing adsorption
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C01B 21/0494**{Combined chemical and physical processing}****Definition statement***This place covers:*

All processes comprising a sequence of steps each covered by the groups [C01B 21/0411](#)-[C01B 21/0488](#)

Special rules of classification

All processes comprising a sequence of steps each covered by the groups [C01B 21/0411](#)-[C01B 21/0488](#) do get this symbol [C01B 21/0494](#) in combination with symbols for the individual steps chosen from [C01B 2210/00](#)-[C01B 2210/0025](#). Additional treatment steps which are the result of the main treatment operation are not recognised as separate step (e.g. removal of water by an adsorption step after the reductive treatment with hydrogen for the removal of oxygen during which the water is formed).

Groups for the type of impurity removed ([C01B 2210/0043](#)) are always applied as complete as possible.

C01B 21/06

Binary compounds of nitrogen with metals, with silicon, or with boron, {or with carbon, i.e. nitrides; Compounds of nitrogen with more than one metal, silicon or boron} (azides [C01B 21/08](#))

References**Limiting references***This place does not cover:*

Azides	C01B 21/08
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Shaped bodies made of nitrides:	C04B 35/58 and subgroups
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Special rules of classification

- A document specifying a series of binary compounds (e.g. more than 5) is classified in this group with groups chosen from [C01B 21/06-C01B 21/076](#) for the individual compounds.
- All documents of this group and its subgroups up to [C01B 21/0768](#) are fully classified with the symbols chosen from [C01P](#) subgroups.

C01B 21/0602

{with two or more other elements chosen from metals, silicon or boron}

Definition statement

This place covers:

E.g. mixed nitrides.

C01B 21/0605

{Binary compounds of nitrogen with carbon}

Definition statement

This place covers:

All compounds between carbon and nitrogen, C_xN_y

C01B 21/0632

{with gallium, indium or thallium}

Relationships with other classification places

Preparing single crystals of GaN: [C30B](#)

C01B 21/0641

{Preparation by direct nitridation of elemental boron}

Definition statement

This place covers:

Nitridation can take place by any nitrogen source, e.g. nitrogen, ammonia.

C01B 21/0645

{Preparation by carboreductive nitridation}

Definition statement

This place covers:

Processes whereby the boron oxide source is reduced with a carbon containing material like graphite or active carbon, carbon being elemental or not

C01B 21/0646**{Preparation by pyrolysis of boron and nitrogen containing compounds}****Definition statement***This place covers:*

Processes in which the nitrogen is provided by the precursor, although the reaction can take place in an ammonia or nitrogen containing atmosphere.

C01B 21/0648**{After-treatment, e.g. grinding, purification (transformation of hexagonal into cubic or wurtzitic boron nitride [C04B 35/5831](#))}****References****Limiting references***This place does not cover:*

Transformation of hexagonal into cubic or wurtzitic BN	C04B 35/5831
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C01B 21/0682**{Preparation by direct nitridation of silicon}****Definition statement***This place covers:*

Nitridation can take place by any nitrogen source, e.g. nitrogen, ammonia.

C01B 21/0685**{Preparation by carboreductive nitridation}****Definition statement***This place covers:*

Processes whereby the silicon oxide source is reduced with a carbon containing material like graphite or active carbon, carbon being elemental or not.

C01B 21/0722**{Preparation by direct nitridation of aluminium}****Definition statement***This place covers:*

Nitridation can take place by any nitrogen source, e.g. nitrogen, ammonia.

C01B 21/0726**{Preparation by carboreductive nitridation}****Definition statement***This place covers:*

Processes whereby the aluminium oxide source is reduced with a carbon containing material like graphite or active carbon, carbon being elemental or not.

C01B 21/0761**{Preparation by direct nitridation of titanium, zirconium or hafnium}****Definition statement***This place covers:*

Nitridation can take place by any nitrogen source, e.g. nitrogen, ammonia.

C01B 21/0765**{Preparation by carboreductive nitridation}****Definition statement***This place covers:*

Processes whereby the metal oxide source is reduced with a carbon containing material like graphite or active carbon, carbon being elemental or not.

C01B 21/0766**{Preparation by pyrolysis of nitrogen containing titanium, zirconium or hafnium compounds}****Definition statement***This place covers:*

Processes whereby the nitrogen is provided by the precursor although these processes may be accomplished in an ammonia or nitrogen atmosphere.

C01B 21/082

Compounds containing nitrogen and non-metals {and optionally metals}
([C01B 21/06](#), [C01B 21/08](#) take precedence)

References**Limiting references***This place does not cover:*

Binary compounds of nitrogen with metals, Si or B or compounds of nitrogen with more than one metal, Si or B	C01B 21/06
Hydrazoic acid, Azides or halogen azides	C01B 21/08

Special rules of classification

All documents of this group and its subgroups up to [C01B 21/0828](#) are fully classified with the symbols chosen from [C01P](#) subgroups

C01B 21/0844

{Nitrosyl fluoride}

Glossary of terms

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

Nitrosyl fluoride	NOF
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C01B 21/0846

{Nitrosyl chloride}

Glossary of terms

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

Nitrosyl chloride	NOCl
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C01B 21/0923

{Metal imides or amides (silicon imides or amides [C01B 21/087](#))}

Glossary of terms

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

Metal amide	MeNH ₂
Metal imide	MeNH

C01B 21/0926

{of alkali metals}

Definition statement

This place covers:

E.g. lithium amide: LiNH₂; lithium imide: Li₂NH

C01B 21/0935

{Imidodisulfonic acid; Nitrilotrisulfonic acid; Salts thereof}

Glossary of terms

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

Imidodisulfonic acid	HSO ₃ NHSO ₃ H
Nitrilotrisulfonic acid	N(SO ₃ H) ₃

C01B 21/096**Amidosulfonic acid; Salts thereof****Glossary of terms**

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

Amidosulfonic acid	NH_2HSO_3
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C01B 21/12**Carbamic acid {or thiocarbamic acid}; Salts thereof****Glossary of terms**

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

Carbamic acid	H_2NCOOH
Monothiocarbamic	H_2NCOSH or H_2NCSOH
Dithiocarbamic acid	$\text{H}_2\text{NCS}_2\text{H}$
Ammonium carbamate	$\text{H}_2\text{NCOONH}_4$

C01B 21/14**Hydroxylamine; Salts thereof****Glossary of terms**

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

Hydroxylamine:	NH_2OH
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C01B 21/20**Nitrogen oxides; Oxyacids of nitrogen; Salts thereof****Definition statement**

This place covers:

All oxides of nitrogen and their acids

C01B 21/206

{Nitric anhydride (N_2O_5) ([C01B 21/203](#) takes precedence)}

References**Limiting references**

This place does not cover:

Processes using a plasma or electric discharge	C01B 21/203
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C01B 21/22**Nitrous oxide (N₂O) {(C01B 21/203 takes precedence)}****References****Limiting references***This place does not cover:*

Processes using a plasma or electric discharge	C01B 21/203
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C01B 21/24**Nitric oxide (NO) {(C01B 21/203 takes precedence)}****References****Limiting references***This place does not cover:*

Processes using a plasma or electric discharge	C01B 21/203
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C01B 21/265**{characterised by the catalyst}****Relationships with other classification places**Catalysts in general: [B01J](#)**C01B 21/48****Methods for the preparation of nitrates in general (particular individual nitrates, see the relevant groups of subclasses [C01B](#) - [C01G](#), according to the cation)****Definition statement***This place covers:*

Methods for the preparation of nitrates in general and not specific to the chemical nature of the nitrate.

References**Limiting references***This place does not cover:*

Methods relating to one specific metal nitrate are classified according to the cation	C01C , C01D , C01F or C01G
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C01B 21/50**Nitrous acid; Salts thereof****Glossary of terms***In this place, the following terms or expressions are used with the meaning indicated:*

Nitrous acid	HNO ₂
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C01B 23/00**Noble gases; Compounds thereof (liquefying [F25J](#) {; noble gases obtained by rectification [F25J 3/028](#)})****Relationships with other classification places**Liquefaction or liquefying in general: [F25J](#)**References****Limiting references***This place does not cover:*

Obtaining noble gases by processes including a liquefying step	F25J 3/028
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C01B 23/001**{Purification or separation processes of noble gases}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Gas separation in general	B01D 53/00
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Special rules of classificationDuring classification are additional features classified using the groups [C01B 2210/00](#)-[C01B 2210/0098](#) . Example of such features is the type of impurity removed ([C01B 2210/0043](#)).**C01B 23/0015****{Chemical processing only}****Definition statement***This place covers:*Those processes comprising only chemical methods not covered by the subgroups [C01B 23/0021](#)-[C01B 23/0031](#).

C01B 23/0021**{by oxidation}****Definition statement***This place covers:*

Chemical oxidation processes such as removal of hydrogen by addition of oxygen to the feed gas. The impurity is oxidized.

C01B 23/0026**{by reduction}****Definition statement***This place covers:*

Chemical reduction processes such as the removal of oxygen by addition of a reducing agent, like hydrogen. The impurity is reduced.

C01B 23/0036**{Physical processing only}****Definition statement***This place covers:*

Those processes comprising only physical methods as e.g. specified by the subgroups [C01B 23/0042](#) - [C01B 23/0089](#).

C01B 23/0042**{by making use of membranes}****References****Limiting references***This place does not cover:*

Membranes as such:	B01D 61/00 - B01D 71/00
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Synonyms and Keywords

Pressure swing absorption	PSA
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C01B 23/0057**{characterised by the adsorbent}****References****Limiting references***This place does not cover:*

Solid sorbent compositions	B01J 20/00
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C01B 23/0078**{Temperature swing adsorption}****Glossary of terms***In this place, the following terms or expressions are used with the meaning indicated:*

TSA	temperature swing adsorption
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C01B 23/0094**{Combined chemical and physical processing}****Definition statement***This place covers:*

All processes comprising a sequence of steps each covered by the groups [C01B 23/0015](#)-[C01B 23/0089](#)

Special rules of classification

All processes comprising a sequence of steps each covered by the groups [C01B 23/0015](#)-[C01B 23/0089](#) do get this symbol [C01B 23/0094](#) in combination with symbols for the individual steps chosen from [C01B 2210/00](#)-[C01B 2210/0025](#). Additional treatment steps which are the result of the main treatment operation are not recognised as separate step (e.g. removal of water by an adsorption step after the reductive treatment with hydrogen for the removal of oxygen during which the water is formed).

Groups for the type of impurity removed ([C01B 2210/0043](#)) or the type of noble gas obtained ([C01B 2210/0029](#)) are always applied as complete as possible.

C01B 25/00

Phosphorus; Compounds thereof ({[C01B 6/00](#)}, [C01B 21/00](#), [C01B 23/00](#) take precedence; perphosphates [C01B 15/16](#))

Definition statement*This place covers:*

Elemental phosphorus and compounds thereof. Included in this group are processes and apparatus used in obtaining these products. Also included in this group are processes and apparatus for after-treatments in general of phosphorous compounds and not related to a specific phosphorous compound.

References**Limiting references***This place does not cover:*

Hydrides of metals and phosphorus	C01B 6/00
Perphosphates	C01B 15/16
Compounds containing nitrogen and phosphorus	C01B 21/00
Compounds containing noble gases and phosphorus	C01B 23/00

Informative references

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

Phosphates for prostheses or for coating prostheses	A61L 27/00
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C01B 25/006

{Stabilisation ([C01B 25/04](#) takes precedence)}

References**Limiting references**

This place does not cover:

Purification of phosphorus	C01B 25/04
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C01B 25/16

Oxyacids of phosphorus; Salts thereof (peroxyacids or salts thereof [C01B 15/00](#))

References**Limiting references**

This place does not cover:

Peroxyacids of phosphorus or salts thereof	C01B 15/00
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Special rules of classification

- Carbonated apatites classified in [C01B 25/16](#)
- Thiophosphates classified in [C01B 25/16](#)

C01B 25/234

Purification; Stabilisation; Concentration (purification concomitant with preparation [C01B 25/22](#); preparation involving solvent-solvent extraction [C01B 25/46](#))

References**Limiting references**

This place does not cover:

Purification concomitant with preparation of phosphoric acid	C01B 25/22
If the preparation of phosphoric acid involves a solvent-solvent extraction	C01B 25/46

C01B 25/237

Selective elimination of impurities {(C01B 25/2343 takes precedence)}

References**Limiting references**

This place does not cover:

Concentration concomitant with selective elimination of impurities	C01B 25/2343
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C01B 25/26

Phosphates (perphosphates [C01B 15/16](#))

References**Limiting references**

This place does not cover:

Perphosphates	C01B 15/16
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C01B 25/301

{Preparation from liquid orthophosphoric acid or from an acid solution or suspension of orthophosphates (using ion-exchangers [C01B 25/30](#))}

References**Limiting references**

This place does not cover:

Preparation of alkali metal phosphates using ion-exchangers	C01B 25/30
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C01B 25/32

Phosphates of magnesium, calcium, strontium, or barium

References**Limiting references**

This place does not cover:

Carbonate-containing phosphates, e.g. carbonated apatite	C01B 25/16
Fluorine-containing phosphates, e.g. fluoroapatite	C01B 25/455

C01B 25/321

{Methods for converting an alkaline earth metal ortho-phosphate into another ortho-phosphate (by reaction, e.g. of phosphate rock with phosphoric acid [C01B 25/322](#))}

References**Limiting references**

This place does not cover:

Methods by reaction, e.g. phosphate rock, with phosphoric acid	C01B 25/322
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C01B 25/325

{Preparation by double decomposition}

Glossary of terms

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

Double decomposition	Method which consists of adding a Me cation salt solution (Me: Mg, Sr or Ca) to a solution of PO ₄ anion salt
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C01B 25/327

{After-treatment (increasing the phosphate content of ores [C01B 25/32](#))}

References**Limiting references**

This place does not cover:

Increasing the phosphate content of ores	C01B 25/32
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C01B 25/37**Phosphates of heavy metals****Definition statement**

This place covers:

Also classified here are rare earth phosphates

Glossary of terms

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

Heavy metals	Phosphates of metals other than light metals, i.e. alkali metals, alkaline earth metals, Be, Al and Mg.
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C01B 25/455

containing halogen {(completely halogenated alkali metal phosphates [C01D](#), e.g. lithium hexafluorophosphate [C01D 15/005](#))}

References**Limiting references**

This place does not cover:

Completely halogenated alkali metal phosphates	C01D
E.g. lithium hexafluorophosphate	C01D 15/005

C01B 25/46

Preparation involving solvent-solvent extraction (solvent extraction in general [B01D 11/00](#))

References**Limiting references**

This place does not cover:

Solvent extraction in general	B01D 11/00
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C01B 25/461

{the phosphoric acid present in the medium obtained after reaction being first extracted from the liquid phase formed or separated then re-extracted as free acid by using water or as a phosphate by using a basic compound (selective extraction of impurities contained in acid [C01B 25/237](#))}

References**Limiting references**

This place does not cover:

Selective extraction of impurities contained in acid	C01B 25/237
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Special rules of classification

- The extracting agent may be diluted with a compound or a mixture of compounds which are not solvents for phosphoric acid, e.g. a hydrocarbon.
- Documents which belong to more than one subgroup of [C01B 25/462](#) - [C01B 25/466](#) are classified in combination, C-set used, e.g. [C01B 25/462](#), [C01B 25/463](#), [C01B 25/465](#).

C01B 25/468

{the extraction being performed on the reaction slurry itself, i.e. without separating the acid ([C01B 25/232](#) takes precedence)}

Special rules of classification

[C01B 25/232](#) takes precedence

C01B 32/00

Carbon; Compounds thereof (C01B 21/00, C01B 23/00 take precedence; percarbonates C01B 15/10; carbon black C09C 1/48)

Definition statement

This place covers:

Carbon and inorganic compounds thereof. Included in this group are processes and apparatus used in obtaining these products.

Preparation of carbonyl fluoride or carbonyl bromide.

Relationships with other classification places

C01B 32/60 covers preparation of carbonates or bicarbonates in general. Percarbonates are covered by C01B 15/10 and particular individual carbonates are covered by the relevant groups in C01B-C01G according to the cation.

References

Limiting references

This place does not cover:

Percarbonates	C01B 15/10
Carbon black	C09C 1/48

Informative references

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

Processes of preparing hydrogen	C01B 3/00
Separation of vapours by condensation	B01D 5/00
Separation by sublimation	B01D 7/00
Separation of gases or vapours by adsorption	B01D 53/02
Separation of gases or vapours by absorption	B01D 53/14
Separation of gases or vapours by diffusion	B01D 53/22
Processes of preparing urea or its derivatives	C07C 273/00
Purifying or modifying the chemical composition of combustible gases containing carbon monoxide	C10K
Processes or apparatus for liquefying or solidifying gases or gaseous mixtures	F25J 1/00
Processes or apparatus for separating the constituents of gaseous mixtures involving the use of liquefaction or solidification	F25J 3/00

Special rules of classification

In this main group and the subclass C01B, the last place priority rule is applied, i.e. at each hierarchical level, in the absence of an indication to the contrary, a compound is classified in the last appropriate place, however, the main groups C01B 21/00 and C01B 23/00 take precedence over this main group.

Preparation of intercalation compounds of graphite with fluorine are classified in [C01B 32/22](#).

C01B 32/05

Preparation or purification of carbon not covered by groups [C01B 32/15](#), [C01B 32/20](#), [C01B 32/25](#), [C01B 32/30](#)

Definition statement

This place covers:

Preparation or purification of carbon products not referred to in [C01B 32/15](#), [C01B 32/20](#), [C01B 32/25](#) or [C01B 32/30](#), e.g. carbon gel, carbon aerogel, mesoporous carbon, ordered porous carbon or carbon.

References

Informative references

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

Carbon obtained by using ultra high pressure, e.g. for the formation of diamond	B01J 3/06
Processes of growing single crystal carbon or homogeneous polycrystalline carbon	C30B

C01B 32/152

Fullerenes

Definition statement

This place covers:

All types of fullerenes, and their preparation; after-treatments thereof, e.g. purification, sorting, functionalization or dispersion in solvents.

Glossary of terms

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

Fullerene	Molecule composed entirely of carbon in the form of a hollow sphere
Buckminsterfullerene	Spherical molecule with the formula C ₆₀
Endohedral fullerene	Fullerene comprising an element inserted into the fullerene cage

Synonyms and Keywords

In patent documents, the word/expression in the first column is often used instead of the word/expression in the second column, which is used in the classification scheme of this place:

Fullerene	Buckyball
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C01B 32/158

Carbon nanotubes

References

Informative references

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

Fine structural details of nanotubes	C01P 2004/13
Coating by vacuum evaporation, by sputtering or by ion implantation of the coating material	C23C 14/00
Chemical coating by decomposition of gaseous compounds, without leaving reaction products of surface material in the coating	C23C 16/00

Special rules of classification

All documents in [C01B 32/158-C01B 32/178](#) are classified with symbols chosen from [C01B 2202/00](#) - [C01B 2202/36](#) to report structural aspects or properties of carbon nanotubes.

Mere references to "carbon nanotubes" in a document in the absence of other details do not lead to a classification in [C01B 32/158](#). For example, a reference to a "carbon nanotube" grown on a substrate used for a semiconductor device is not sufficient for requiring a classification in [C01B 32/158](#). If, however, the document includes specific details on how the nanotube is produced, treated, modified or purified which do not seem trivial, then the document is classified in [C01B 32/158](#) - [C01B 32/178](#). In other terms, documents referring to carbon nanotubes are not automatically classified in [C01B 32/00](#) unless there is emphasis, e.g. on the nanotube growing technique or the after-treatment.

Glossary of terms

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

Carbon nanotubes	Described as graphene sheets rolled up into the shape of a cylinder
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Synonyms and Keywords

In patent documents, the word/expression in the first column is often used instead of the word/expression in the second column, which is used in the classification scheme of this place:

Nanotubes	Buckytubes
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C01B 32/162

characterised by catalysts

Definition statement

This place covers:

Catalysts, from which nanotubes were grown, e.g. composition, distribution, particle size or morphology.

C01B 32/164**involving continuous processes****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Production of carbon nanotubes in batches	C01B 32/16 , C01B 32/162 or C01B 32/166
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C01B 32/168**After-treatment****Definition statement***This place covers:*After-treatments not addressed in [C01B 32/17](#)-[C01B 32/178](#), e.g. coating of carbon nanotubes.**References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Coatings of a carbon nanotube by a layer or a film, e.g. by a metallic layer or an oxide layer (to form a layered product)	B32B
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C01B 32/172**Sorting****Definition statement***This place covers:*

Methods for sorting or isolating as-grown mixtures of carbon nanotubes according to their (n, m) structural form, e.g. diameter, bandgap or electronic type (metallic versus semiconducting).

C01B 32/178**Opening; Filling****Special rules of classification**

A document mentioning the storage of a gas using the physisorption or chemisorption properties of carbon nanotubes should be classified in the group concerned, for example a document addressing the storage of hydrogen should be classified in [C01B 3/00](#), and further classified in the sorbent field, e.g. in [B01J 20/00](#).

C01B 32/18

Nanoonions; Nanoscrolls; Nanohorns; Nanocones; Nanowalls

Definition statement

This place covers:

All nanosized carbon materials different from fullerenes and nanotubes, which are characterized by a specific structural aspect.

Glossary of terms

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

Nanoonion	Structure in which a plurality of graphene sheets are closed concentric spherical shell shape.
Nanoscroll	Similar to that of a multi-walled carbon nanotube, but with a spiral-like rolled-up geometry and open edges at the ends.
Nanohorn	Described as graphene sheets rolled up into the shape of a cylinder and its tip is closed.
Nanocone	Described as graphene sheets made into the shape of a conical structure.
Nanowall	Two-dimensional structure in which the graphene sheets are oriented perpendicular to the substrate.

C01B 32/182

Graphene

Definition statement

This place covers:

The production of graphene aerogel.

Special rules of classification

All documents in groups [C01B 32/182](#) - [C01B 32/196](#) are classified with symbols chosen from [C01B 2204/00](#) - [C01B 2204/32](#) to report structural aspects or properties of graphene.

Glossary of terms

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

Graphene	one-atom-thick planar sheet of sp ² -bonded carbon atoms that are densely packed in a honeycomb crystal lattice or small stacks thereof
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C01B 32/186**by chemical vapour deposition [CVD]****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Coating by vacuum evaporation, by sputtering or by ion implantation of the coating material	C23C 14/00
Chemical coating by decomposition of gaseous compounds, without leaving reaction products of surface material in the coating	C23C 16/00

C01B 32/194**After-treatment****Definition statement***This place covers:*

After-treatment of graphene, e.g. sorting, derivatising or dispersing of graphene.

C01B 32/23**Oxidation****Definition statement***This place covers:*

Graphene oxide.

C01B 32/25**Diamond****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Formation of diamonds by using ultra-high pressure	B01J 3/06
Single crystal or polycrystalline structure in which the grains are aligned in a preferential direction	C30B

C01B 32/30**Active carbon****Definition statement***This place covers:*

Carbon activated by heating to high temperature in the presence of an activating agent for producing an internal porous particle structure.

Glossary of terms

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

Active carbon	Highly adsorptive carbon material with porous structure.
Gaseous activating agent	Gases, such as steam, for use to develop the pore structure of active carbon.
Non-gaseous activating agent	Chemicals, such as zinc chloride, for use to develop the pore structure of active carbon.

Synonyms and Keywords

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

- Activated carbon
- Active carbon
- Carbon molecular sieve

C01B 32/306

with molecular sieve properties

Glossary of terms

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

CMS	Carbon molecular sieve
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C01B 32/336

characterised by gaseous activating agents

Definition statement

This place covers:

Gaseous activation by means of combined-oxygen containing gases, such as steam and CO₂.

C01B 32/342

characterised by non-gaseous activating agents

Definition statement

This place covers:

Activation in the presence of non-gaseous activating agents, e.g. ZnCl₂, H₃PO₄ or KOH.

C01B 32/348

Metallic compounds

Definition statement

This place covers:

Activation in the presence of a metallic compound, e.g. ZnCl₂.

C01B 32/384**Granulation****References****Informative references**

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

Granulation in general	B01J 2/00
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Glossary of terms

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

The term granulation covers:	The methods of preparation of active carbon using carbonaceous precursors per se and binders, e.g. pitch, and producing the granules.
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C01B 32/40**Carbon monoxide****References****Informative references**

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

Metal carbonyls	C01G
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C01B 32/60

Preparation of carbonates or bicarbonates in general (of percarbonates [C01B 15/10](#); of specific carbonates or bicarbonates according to the cation [C01B-C01G](#))

References**Limiting references**

This place does not cover:

Particular individual carbonates, according to the cation	C01B - C01G
Percarbonates	C01B 15/10

C01B 32/80**Phosgene****References****Informative references**

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

Carbonyl difluoride	C01B 32/00
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C01B 32/90**Carbides****References****Informative references**

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

Alloys	C22C
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C01B 33/00

Silicon; Compounds thereof ({[C01B 6/00](#),} [C01B 21/00](#), [C01B 23/00](#) take precedence; persilicates [C01B 15/14](#); carbides [C01B 32/956](#))

References**Limiting references**

This place does not cover:

Persilicates	C01B 15/14
Carbides	C01B 32/956

Informative references

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

Apparatus for producing silicon or a compound thereof according to C01B 33/00 - C01B 33/46	B01J 3/00 , B01J 4/00
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Special rules of classification

[C01B 6/00](#), [C01B 21/00](#) and [C01B 23/00](#) take precedence

C01B 33/02

Silicon (forming single crystals or homogeneous polycrystalline material with defined structure [C30B](#))

References**Limiting references**

This place does not cover:

Single crystals or homogeneous polycrystalline material with a defined structure	C30B
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C01B 33/021

Preparation (chemical coating from the vapour phase [C23C 16/00](#))

Definition statement

This place covers:

- Silicon nanotubes
- Silicon nanowires without any emphasis on the crystalline structure

References**Limiting references**

This place does not cover:

Chemical coating by decomposition of gaseous precursor	C23C 16/00
Silicon nanowires (often grown by the methods for the growth of single crystal whiskers) where there is emphasis on the crystalline nature	C30B

C01B 33/037

Purification (by zone-melting [C30B 13/00](#))

References**Limiting references**

This place does not cover:

Purification by zone melting	C30B 13/00
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C01B 33/04

Hydrides of silicon

Definition statement

This place covers:

Hydrides of silicon in the strict meaning of the term.

C01B 33/06**Metal silicides (alloys [C22](#))****References****Limiting references***This place does not cover:*

Alloys	C22
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C01B 33/113**Silicon oxides; Hydrates thereof {(preparing monoxide by reduction of siliceous material [C01B 33/182](#))}****References****Limiting references***This place does not cover:*

Preparation of silicon monoxide by reduction of siliceous material	C01B 33/182
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C01B 33/12**Silica; Hydrates thereof, e.g. lepidoid silicic acid****Glossary of terms***In this place, the following terms or expressions are used with the meaning indicated:*

Lepidoid acid	Acid which has a two-dimensional structure. The term "lepidoid" is a generic word for a compound wherein planar bonding predominates and two-dimensional network structures are formed. This lepidoid silicic acid is a special type of polymer silicic acid, wherein its crystalline structure is built up of siloxane bondings.
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C01B 33/146**After-treatment of sols {(preparation of hydrosols or aqueous dispersions from hydroorganosols, organosols or dispersions in an organic medium [C01B 33/141](#)}; preparation of hydroorganosols, organosols or dispersions in an organic medium from hydrosols {or aqueous dispersions} [C01B 33/145](#))}****References****Limiting references***This place does not cover:*

Preparation of hydrosols or aqueous dispersions from hydroorganosols, organosols or dispersions in an organic medium	C01B 33/141
Preparation of hydroorganosols, organosols or dispersions in an organic medium from hydrosols or aqueous dispersions	C01B 33/145

C01B 33/148

Concentration; Drying; Dehydration; Stabilisation; Purification {([C01B 33/1465](#) takes precedence)}

Special rules of classification

[C01B 33/1465](#) takes precedence.

C01B 33/1585

{Dehydration into aerogels}

Glossary of terms

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

Silica aerogel	What remains after the extraction of the liquid from the framework of the silica gel in a way that preserves the gel framework's original volume. This is most often achieved by supercritical extraction.
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C01B 33/16

Preparation of silica xerogels

Glossary of terms

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

Xerogel	What remains when the liquid part of a wet gel is extracted by evaporation or similar methods. The shrinkage during extraction is often important.
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C01B 33/18

Preparation of finely divided silica neither in sol nor in gel form; After-treatment thereof (preparation of aerogels by dehydrating gels [C01B 33/158](#); treatment to enhance the pigmenting or filling properties [C09C](#))

References**Limiting references**

This place does not cover:

Preparation of a silica aerogel by dehydrating a wet gel	C01B 33/158
Treatments of finely divided silica to enhance the pigmenting or filling properties	C09C

C01B 33/20

Silicates (persilicates [C01B 15/14](#) {; containing aluminium [C01B 33/26](#)})

References**Limiting references**

This place does not cover:

Persilicates	C01B 15/14
Silicates containing aluminium	C01B 33/26

C01B 33/28

{Base exchange silicates, e.g. zeolites (regeneration [B01J 49/00](#))}

Special rules of classification

[C01B 33/28](#) - [C01B 33/2892](#): no longer to be used but cannot be deleted until splitting of groups to [C01B 39/00](#) is completed. Use [C01B 39/00](#) for classification

C01B 33/32

Alkali metal silicates ({[C01B 33/24](#)}, [C01B 33/26](#) take precedence)

Special rules of classification

[C01B 33/26](#) takes precedence.

C01B 33/325

{After-treatment, e.g. purification or stabilisation of solutions, granulation; Dissolution; Obtaining solid silicate, e.g. from a solution by spray-drying, flashing off water or adding a coagulant}

References**Limiting references**

This place does not cover:

Obtaining a silicate, e.g. as a hydrate of a crystalline silicate from a solution or a hydrate melt by heating or cooling with or without seeding (not considered as an after-treatment)	C01B 33/32
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C01B 33/36

having base-exchange properties but not having molecular sieve properties (regeneration thereof [B01J 49/00](#))

References**Limiting references**

This place does not cover:

Compounds having base-exchange properties and having molecular sieve properties	C01B 39/00
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C01B 33/38

Layered base-exchange silicates, e.g. clays, micas or alkali metal silicates of kenyaite or magadiite type {(activation of naturally occurring clays [B01J 20/12](#); pillared layered base-exchange silicates [B01J 29/049](#))}

References**Limiting references**

This place does not cover:

Activation of naturally occurring clays	B01J 20/12
Pillared layered base-exchange silicates	B01J 29/049
Hydrotalcite (layered anion-exchange compound of formula $\text{Mg}_6\text{Al}_2(\text{CO}_3)(\text{OH})_{16} \cdot 4(\text{H}_2\text{O})$)	C01F 7/785

C01B 33/40**Clays****Glossary of terms**

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

Clays	phyllosilicate minerals that contain large percentages of water trapped between their silica sheets
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C01B 33/42

Micas {; Interstratified clay-mica products (delaminated mica or vermiculite platelets obtained by a process involving cation-exchange [C04B 14/208](#))}

References**Limiting references**

This place does not cover:

Delaminated mica or vermiculite platelets obtained by a process involving cation-exchange	C04B 14/208
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Special rules of classification

Also classified here are documents interstratified clay-mica products.

Glossary of terms

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

Mica	phyllosilicate mineral having a layered or platy structure, composed of sheets of silicate tetrahedrons. two tetrahedral layers sandwich small metal ions such as aluminum in an octahedral layer
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C01B 33/46

Amorphous silicates, e.g. so-called "amorphous zeolites" (crystalline zeolites [C01B 39/00](#))

Relationships with other classification places

Catalysts comprising molecular sieves are classified in the group [B01J 29/00](#). Catalyst carriers are covered by appropriate groups of [B01J 21/00](#) - [B01J 29/00](#).

Solid sorbent composition comprising synthetic zeolitic molecular sieves are classified in [B01J 20/00](#)

References

Limiting references

This place does not cover:

Crystalline silicates having molecular sieve properties	C01B 39/00
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C01B 37/00

Compounds having molecular sieve properties but not having base-exchange properties

Relationships with other classification places

Compounds classified in main group [C01B 37/00](#) are also classified in other groups of class [C01](#) according to their composition.

Metal organic framework materials (MOFs) is classified in [C01B 39/00](#) or [C01B 37/00](#) depending on their base-exchange properties

MOFs are also classified in [C07F](#).

C01B 37/005

{Silicates, i.e. so-called metasilicalites or metallozeosilites}

Definition statement

This place covers:

Silicates, metasilicalites, metallozeosilites

Glossary of terms

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

TS-1 or titanosilicalite-1	MFI-type compound in which some of the silicon atoms are substituted with titanium atoms
TS-2 or titanosilicalite-2	MEL-type compound in which some of the silicon atoms are substituted with titanium atoms

C01B 37/02

Crystalline silica-polymorphs, e.g. silicalites {dealuminated aluminosilicate zeolites}

References

Informative references

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

Dealuminated aluminosilicate	C01B 39/026
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Glossary of terms

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

Silicalite or silicalite-1	MFI-type polymorph of silica
Silicalite-2	MEL-type polymorph of silica

C01B 37/06

Aluminophosphates containing other elements, e.g. metals, boron

Definition statement

This place covers:

aluminophosphates including other elements incorporated into the framework

C01B 39/00

Compounds having molecular sieve and base-exchange properties, e.g. crystalline zeolites; Their preparation; After-treatment, e.g. ion-exchange or dealumination (treatment to modify the sorption properties, e.g. shaping using a binder, [B01J 20/10](#); treatment to modify the catalytic properties, e.g. combination of treatments to make the zeolites appropriate to their use as a catalyst, [B01J 29/04](#); treatment to improve the ion-exchange properties [B01J 39/14](#))

References

Limiting references

This place does not cover:

Treatment to modify the sorption properties, e.g. shaping using a binder	B01J 20/10
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Treatment to modify the catalytic properties, e.g. combination of treatments to make the zeolites appropriate to their use as a catalyst	B01J 29/04
Treatment to improve the ion-exchange properties	B01J 39/14

Informative references

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

Regeneration or reactivation of ion-exchange properties	B01J 49/00
Preparation of stabilised suspensions used in detergents	C11D 3/12

Special rules of classification

Compounds classified in main group [C01B 39/00](#) are also classified in other groups of class [C01](#) according to their composition.

Metal organic framework materials (MOFs) are classified in [C01B 39/00](#) or [C01B 37/00](#) depending on their base-exchange properties.

MOFs are also classified in [C07F](#).

Glossary of terms

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

Zeolites	(i) Crystalline aluminosilicates with base-exchange properties, having three-dimensional porous lattice framework of tetrahedral oxide units (ii) Compounds isomorphous to those of the former category, wherein the aluminum or silicon atoms in the framework are partly or wholly replaced by atoms of other elements, e.g. Ga, Ge, P or B.
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C01B 39/02

Crystalline aluminosilicate zeolites; Isomorphous compounds thereof; Direct preparation thereof; Preparation thereof starting from a reaction mixture containing a crystalline zeolite of another type, or from preformed reactants; After-treatment thereof

Glossary of terms

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

Organic additive, organic template directing agent, templating agent, template, structure directing agent (SDA), structuring agent	Any component present in the reaction mixture, which directs the formation of the framework about it.
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C01B 39/026**{After-treatment}****Definition statement***This place covers:*

Dealumination of an aluminosilicate zeolite and ion-exchange. Also classified there are documents in which there is a particular emphasis on a process for removing an organic structure directing agent occluded within the as-synthesized zeolite framework. If the removing of the organic structure directing agent is not the invention, only mentioned in the document, it's not classified.

The normal steps of zeolite preparation like synthesis mixture, washing, calcination are not considered as post treatment.

References**Limiting references***This place does not cover:*

Treatment to modify the sorption properties, e.g. shaping using a binder	B01J 20/10
Treatment to modify the catalytic properties, e.g. combination of treatments to make the zeolites appropriate to their use as a catalyst	B01J 29/04
Treatment to improve the ion-exchange properties	B01J 39/14
Regeneration or reactivation of ion-exchange properties	B01J 49/00
Preparation of stabilised suspensions used in detergents	C11D 3/12

C01B 39/06

Preparation of isomorphous zeolites characterised by measures to replace the aluminium or silicon atoms in the lattice framework by atoms of other elements {, i.e. by direct or secondary synthesis}

Definition statement*This place covers:*

Preparation isomorphous zeolites (i.e. wherein the aluminium or silicon atoms in the framework are partly or wholly replaced by atoms of other elements, e.g. Ga, Ge, P or B) obtained by direct or secondary synthesis.

C01B 39/14**Type A****Definition statement***This place covers:*

Zeolite of LTA structure

References

Limiting references

This place does not cover:

Preparation using at least one organic template	C01B 39/145
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Special rules of classification

Groups [C01B 39/023](#), [C01B 39/026](#) and **C01B36/06** take precedence

Glossary of terms

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

Framework topology code LTA	type A, Linde A or Linde type A as exemplified in patent document US2882243
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C01B 39/16

from aqueous solutions of an alkali metal aluminate and an alkali metal silicate excluding any other source of alumina or silica but seeds {([C01B 39/145](#) takes precedence)}

Special rules of classification

[C01B 39/145](#) takes precedence

C01B 39/18

from a reaction mixture containing at least one aluminium silicate or aluminosilicate of a clay type, e.g. kaolin or metakaolin or its exotherm modification or allophane {([C01B 39/145](#) takes precedence)}

Special rules of classification

[C01B 39/145](#) takes precedence

C01B 39/20

Faujasite type, e.g. type X or Y

References

Limiting references

This place does not cover:

Preparation using at least one organic template	C01B 39/205
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Special rules of classification

Groups [C01B 39/023](#), [C01B 39/026](#) and **C01B36/06** take precedence

Glossary of terms

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

Framework topology code FAU	Faujasite
Type X (framework topology code FAU)	Linde X or Linde type X exemplified by patent document US2882244
Type Y (framework topology code FAU)	Linde Y or Linde type Y exemplified by patent document US3130007)

C01B 39/22

Type X {(C01B 39/205 takes precedence)}

References

Limiting references

This place does not cover:

Synthesis using a template directing agent	C01B 39/205
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Special rules of classification

C01B 39/205 takes precedence

C01B 39/24

Type Y {(C01B 39/205 takes precedence)}

References

Limiting references

This place does not cover:

Synthesis using a template directing agent	C01B 39/205
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Special rules of classification

C01B 39/205 takes precedence

C01B 39/26

Mordenite type {(C01B 39/023, C01B 39/026, C01B 39/06 take precedence)}

References

Limiting references

This place does not cover:

Preparation using at least one organic template	C01B 39/265
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Special rules of classification

Groups C01B 39/023, C01B 39/026 and C01B36/06 take precedence

Glossary of terms

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

Framework topology code MOR	Mordenite
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C01B 39/28

Phillipsite or harmotome type {([C01B 39/023](#), [C01B 39/026](#), [C01B 39/06](#) take precedence)}

Definition statement

This place covers:

documents dealing with harmotome or phillipsite type materials.

Special rules of classification

Groups [C01B 39/023](#), [C01B 39/026](#) and **C01B36/06** take precedence

Glossary of terms

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

Framework topology code PHI	Phillipsite
Harmotome	natural zeolite with framework topology code PHI

C01B 39/30

Erionite or offretite type, e.g. zeolite T

References

Limiting references

This place does not cover:

Preparation using at least one organic template	C01B 39/305
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Special rules of classification

Groups [C01B 39/023](#), [C01B 39/026](#) and **C01B36/06** take precedence

Glossary of terms

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

Zeolite T (Framework topology code: ERI/OFF)	or Linde T exemplified by patent document US2950952
Framework topology code ERI	Erionite
Framework topology code OFF	Offretite

C01B 39/32**Type L****Special rules of classification**

Groups [C01B 39/023](#), [C01B 39/026](#) and **C01B36/06** take precedence

Glossary of terms

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

Type L (Framework topology code LTL)	Linde L or Linde type L exemplified in patent document US3216789
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C01B 39/34**Type ZSM-4****Definition statement**

This place covers:

Zeolites with framework topology code MAZ.

Special rules of classification

Groups [C01B 39/023](#), [C01B 39/026](#) and **C01B36/06** take precedence

Glossary of terms

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

ZSM4 (Framework topology code MAZ)	exemplified by patent document GB1117568
Omega (Framework topology code MAZ)	exemplified by patent document GB1178186
Framework topology MAZ	Mazzite

C01B 39/36**Pentasil type, e.g. types ZSM-5, ZSM-8 or ZSM-11****Special rules of classification**

Groups [C01B 39/023](#), [C01B 39/026](#) and **C01B36/06** take precedence.

C01B 39/365**{Type ZSM-8; Type ZSM-11; ZSM 5/11 intermediate}****Definition statement**

This place covers:

only the identified type ZSM-8, ZSM-11, ZSM5/11 intermediate

The mixture of MFI and MEL frameworks, any intergrowth of MFI and MEL frameworks are classified in [C01B 39/36](#)

Glossary of terms

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

ZSM-8 (framework topology code MFI/MEL)	exemplified by patent document US3702886; thought to be an intergrowth of ZSM-5 with ZSM-11
ZSM-11 (framework topology code MEL)	exemplified by patent document US3709979
ZSM-5/11 (framework topology code MFI/MEL)	intergrowth product of the ZSM-5 and ZSM-11; exemplified by patent document US4289607
Framework topology code MFI	ZSM-5
Framework topology code MEL	ZSM-11

C01B 39/38**Type ZSM-5****References****Limiting references**

This place does not cover:

Preparation using at least one organic template	C01B 39/40
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Glossary of terms

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

ZSM-5 (Framework topology code MFI)	exemplified by patent document US3702886
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C01B 39/42**Type ZSM-12****Special rules of classification**

Groups [C01B 39/023](#), [C01B 39/026](#) and **C01B36/06** take precedence

Glossary of terms

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

Framework topology code MTW	ZSM-12 exemplified by patent document US3832449
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C01B 39/44

Ferrierite type, e.g. types ZSM-21, ZSM-35 or ZSM-38

References**Limiting references**

This place does not cover:

Preparation using at least one organic template	C01B 39/445
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Special rules of classification

Groups [C01B 39/023](#), [C01B 39/026](#) and **C01B36/06** take precedence

Glossary of terms

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

Framework topology code FER	Ferrierite
ZSM-21 (Framework topology code FER)	exemplified by patent document US4046859
ZSM-35 (Framework topology code: FER)	exemplified by patent document US4046859
ZSM-38 (Ferrierite-type)	exemplified by patent document US4016245

C01B 39/46

Other types characterised by their X-ray diffraction pattern and their defined composition {([C01B 39/023](#), [C01B 39/026](#), [C01B 39/06](#) take precedence)}

Definition statement

This place covers:

zeolites with specific X-ray diffraction pattern and defined composition not classifiable in the subgroups [C01B 39/14](#) - [C01B 39/445](#)

References**Limiting references**

This place does not cover:

Preparation using at least one organic template	C01B 39/48
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Special rules of classification

Groups [C01B 39/023](#), [C01B 39/026](#) and **C01B36/06** take precedence

C01B 39/50

Zeolites wherein inorganic bases or salts occlude channels in the lattice framework, e.g. sodalite, cancrinite, nosean, hauynite {(ultramarine [C09C 1/32](#))}

References**Limiting references**

This place does not cover:

Ultramarine ($\text{Na}_8[(\text{AlO}_2)_6(\text{SiO}_2)_6]\text{S}_2$)	C09C 1/32
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C01B 39/52

Sodalites

Glossary of terms

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

Sodalite	idea unit cell content: $\text{Na}_8[(\text{AlO}_2)_6(\text{SiO}_2)_6]\text{Cl}_2$
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C01B 39/54

Phosphates, e.g. APO or SAPO compounds

Relationships with other classification places

Catalysts compositions are classified in the groups [B01J 21/00](#) - [B01J 29/00](#). Catalyst carriers are covered by appropriate groups of [B01J 21/00](#) - [B01J 29/00](#).

References**Informative references**

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

APO or SAPO with non clearly defined base-exchange properties	C01B 37/04 - C01B 37/08
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C01B 2203/00

Integrated processes for the production of hydrogen or synthesis gas

References**Informative references**

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

Processes carried out in the presence of solid particles or reactors therefor	B01J 2208/00
Chemical, physical or physico-chemical processes in general	B01J 2219/00