# C01F

## COMPOUNDS OF THE METALS BERYLLIUM, MAGNESIUM, ALUMINIUM, CALCIUM, STRONTIUM, BARIUM, RADIUM, THORIUM, OR OF THE RARE-EARTH METALS (metal hydrides {monoborane, diborane or addition complexes thereof} C01B 6/00; salts of oxyacids of halogens C01B 11/00; peroxides, salts of peroxyacids C01B 15/00; sulfides or polysulfides of magnesium, calcium, strontium, or barium C01B 17/42; thiosulfates, dithionites, polythionates C01B 17/64; compounds containing selenium or tellurium C01B 19/00; binary compounds of nitrogen with metals C01B 21/06; azides C01B 21/08; {compounds other than ammonia or cyanogen containing nitrogen and non-metals and optionally metals C01B 21/082; amides or imides of silicon C01B 21/087}; metal {imides or} amides C01B 21/092, {C01B 21/0923}; nitrites C01B 21/50; {compounds of noble gases C01B 23/0005}; phosphides C01B 25/08; salts of oxyacids of phosphorus C01B 25/16; carbides C01B 32/90; compounds containing silicon C01B 33/00; compounds containing boron C01B 35/00; compounds having molecular sieve properties but not having base-exchange properties C01B 37/00; compounds having molecular sieve and base-exchange properties, e.g. crystalline zeolites, C01B 39/00; cyanides C01C 3/08; salts of cyanic acid C01C 3/14; salts of cyanamide C01C 3/16; thiocyanates C01C 3/20; {double sulfates of magnesium with sodium or potassium C01D 5/12; with other alkali metals C01D 15/00, C01D 17/00})

### Definition statement

*This place covers:*

Compounds of beryllium, e.g. fluorides, oxides, hydroxides.

Compounds of magnesium, e.g. magnesia, hydroxide, carbonates, halides, nitrates, sulfates, sulfites.

Compounds of aluminium, e.g. carbonate, oxides, hydroxides, alkali metal aluminates, halides, nitrates, sulfides, sulfites, sulfates.

Compounds of calcium, strontium or barium, e.g. oxides, hydroxides, carbonates, halides, nitrates, sulfates, sulfites.

Compounds of radium.

Compounds of thorium.

Compounds of the rare earth metals, i.e. scandium, yttrium, lanthanum, lanthanides.

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;
- addition of a stabilizer or preservative; or
- the combination of chemical and physical means, with the proviso that the resultant product is proper for classification in this subclass.

Forming shaped metal compounds covered by C01F and the shaped products, per se, e.g. granules.

All compounds of Be, Mg, Al, Ca, Sr, Ba, Ra, Th or rare earth metals except those compounds which are classified in C01G because of application of the last appropriate place rule. So, in principle does

this subclass comprise all Al-compounds with elements as such being part of C01B-C01D, e.g. $Al_2O_3$, $Al(NO_3)_3$, $Al_2S_3$.

## 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 repellents or attractants, and as plant growth regulators are classified in A01N.
- Preparations for medical, dental, or toilet purposes are classified in A61K.

Ammonium salts of complex acids (other than complex cyanides) containing a metal in the anion are covered by the relevant groups of this subclass or subclasses C01D and C01G, according to the metal.

Complex ammine salts are classified in the relevant groups of this subclass, or subclasses C01D and C01G, according to the metal.

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 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 A61P.

Uses of cosmetics or similar toilet preparations are further classified in A61Q.

## References

### *Limiting references*

*This place does not cover:*

**Exceptions to the last appropriate place rule:**

| | |
|---|---|
| Metal hydrides, monoborane, diborane or addition complexes thereof | C01B 6/00 |
| Salts of oxyacids of halogens | C01B 11/00 |
| Peroxides, salts of peroxyacids | C01B 15/00 |
| Sulfides or polysulfides of magnesium, calcium, strontium, or barium | C01B 17/42 |
| Thiosulfates, dithionites, polythionates | C01B 17/64 |
| Compounds containing selenium or tellurium | C01B 19/00 |
| Binary compounds of nitrogen with metals | C01B 21/06 |
| Azides | C01B 21/08 |
| Compounds other than ammonia or cyanogen containing nitrogen and non-metals and optionally metals | C01B 21/082 |

| | |
|---|---|
| Amides or imides of silicon | C01B 21/087 |
| Metal imides or amides | C01B 21/092, C01B 21/0923 |
| Nitrites | C01B 21/50 |
| Compounds of noble gases | C01B 23/0005 |
| Phosphides | C01B 25/08 |
| Salts of oxyacids of phosphorus | C01B 25/16 |
| Carbides | C01B 32/90 |
| Compounds containing silicon | C01B 33/00 |
| Compounds containing boron | C01B 35/00 |
| Compounds having molecular sieve properties but not having base-exchange properties | C01B 37/00 |
| Compounds having molecular sieve and base-exchange properties, e.g. crystalline zeolites | C01B 39/00 |
| Cyanides | C01C 3/08 |
| Salts of cyanic acid | C01C 3/14 |
| Salts of cyanamide | C01C 3/16 |
| Thiocyanates | C01C 3/20 |
| Double sulfates of magnesium with sodium or potassium | C01D 5/12 |
| Double sulfates of magnesium with lithium | C01D 15/06 |
| Double sulfates of magnesium with rubidium, caesium or francium | C01D 17/00 |
| Production of lime, magnesia or dolomite | C04B 2/00 |
| Burning, calcining lime, magnesite or dolomite | C04B 2/10 |
| Dehydration of gypsum for calcium sulfate cements | C04B 11/02 |
| Preparation of elements or inorganic compounds except carbon dioxide by using microorganisms or enzymes | C12P 3/00 |
| Obtaining metal compounds from mixtures in a metallurgical process | C22B |
| Production of non-metallic elements or inorganic compounds by electrolysis or electrophoresis | C25B |

## *Informative references*

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

| | |
|---|---|
| Crystallisation | B01D 9/00 |
| Calcination | B01J 6/00 |
| Catalysts | B01J 23/00, B01J 27/00, B01J 31/00 |
| General methods of preparing halides | C01B 9/00 |
| Methods for preparing oxides or hydroxides in general | C01B 13/14 |
| Methods for preparing sulfides or polysulfides in general | C01B 17/20 |
| Methods of preparing sulfites in general | C01B 17/62 |
| Methods for the preparation of sulfates in general | C01B 17/96 |

| | |
|---|---|
| Methods for the preparation of nitrates in general | C01B 21/48 |
| Preparation of carbonates or bicarbonates in general | C01B 32/60 |
| Methods of preparing ammonium salts in general | C01C 1/28 |
| Shaped ceramic products characterised by their composition | C04B 35/00 |
| Use of inorganic ingredients, e.g. oxygen-containing compounds, e.g. metal carbonyls | C08K 3/18 |
| Treatment of specific inorganic compounds of alkaline earth metals or magnesium, other than fibrous fillers | C09C 1/02 |
| Macroscopic single crystals: | C30B |

## 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.
- In this subclass, tradenames that are often found in scientific and patent literature have been used to define precisely the scope of the groups.
- 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.
- Compounds comprising in addition to Al, two or more elements (H and O not counted) are classified in C01F 7/78-C01F 7/788.

## Glossary of terms

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

In this subclass, the nomenclature of groups of elements used is defined in the Note after the section title C.

# C01F 1/00

## Methods of preparing compounds of the metals beryllium, magnesium, aluminium, calcium, strontium, barium, radium, thorium, or the rare earths, in general

## Definition statement

*This place covers:*

General preparation features for (mostly groups) of compounds of the elements specified and being part of subclass C01F.

## References

### *Limiting references*

*This place does not cover:*

| | |
|---|---|
| General preparation features of compounds which comprise elements classified in C01G (mostly transition elements): | C01G 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:*

**Preparation of inorganic compounds in general:**

| | |
|---|---|
| Halides: | C01B 9/00 |
| (hydr)oxides: | C01B 13/14 |
| (poly)sulfides: | C01B 17/20 |
| Sulfites: | C01B 17/62 |
| Sulfates: | C01B 17/96 |
| Nitrates: | C01B 21/48 |
| Nitrites: | C01B 21/50 |
| (bi)carbonates: | C01B 32/60 |
| Ammonium-salts: | C01C 1/28 |

## C01F 3/00

### Compounds of beryllium

### Definition statement

*This place covers:*

All compounds of beryllium except those with elements as such classified after C01F 3/00 and except those as specified after the subclass title of C01F.

## C01F 5/00

### Compounds of magnesium

### Definition statement

*This place covers:*

All compounds of magnesium except those with elements as such classified after C01F 5/00 and except those as specified after the subclass title C01F.

## C01F 7/00

### Compounds of aluminium

### Synonyms and Keywords

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

- aluminium, aluminum

## C01F 7/02

### Aluminium oxide; Aluminium hydroxide; Aluminates

### Definition statement

*This place covers:*

All aluminium oxides, hydroxides, (oxy)hydroxides or aluminates.

## References

### *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:*

| | |
|---|---|
| Aluminosilicates: | C01B 33/26 |
| Zeolites: | C01B 39/00 |

### *Informative references*

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

| | |
|---|---|
| Organic compounds containing aluminium | C07F 5/06 |

## Special rules of classification

A document disclosing an aluminium oxide or hydroxide prepared by one single preparation method is classified according to the method. A document teaching the oxide or hydroxide compound as such and specifying method(s) for preparation is classified according to the method(s) and is also classified in C01F 7/02 according to the compound.

## Glossary of terms

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

| | |
|---|---|
| aluminium oxide or hydroxide: | aluminium oxide (all polymorphs, e.g. alpha, gamma), hydroxide or (oxy)hydroxide |
| Bayerite, hydrargilite/gibbsite and norstrandite: | polymorphs of $Al(OH)_3$ |
| Boehmite or diaspore: | polymorphs of AlOOH |
| Corundum or alpha-alumina: | high temperature phase of $Al_2O_3$ |

## Synonyms and Keywords

*In patent documents the following expressions are often used as synonyms:*

| | |
|---|---|
| AlO(OH) aluminium oxyhydroxide | $Al_2O_3.H_2O$ aluminium monohydrate |
| $Al(OH)_3$ aluminium hydroxide | $Al_2O_3 \cdot 3H_2O$ aluminium trihydrate |

# C01F 7/021

### After-treatment of oxides or hydroxides

## Definition statement

*This place covers:*

The physical and chemical after-treatments of aluminium (hydr)oxides in general.

### References

#### *Informative references*

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

| | |
|---|---|
| (After-)Treatments of aluminium (hydr)oxides in order to improve their pigmenting or filling properties | C09C 1/407 |

## C01F 7/04

### Preparation of alkali metal aluminates; Aluminium oxide or hydroxide therefrom (C01F 7/028 takes precedence)

### References

#### *Limiting references*

*This place does not cover:*

| | |
|---|---|
| Aluminates with a minor amount of other elements and chaaracterised as beta-alumina's: | C01F 7/028 |

## C01F 7/06

### by treating aluminous minerals or waste-like raw materials with alkali hydroxide, e.g. leaching of bauxite according to the Bayer process (obtaining aluminium oxide or hydroxide from the resulting aluminate solution C01F 7/14)

### Definition statement

*This place covers:*

Treatments of bauxite according to the Bayer process insofar it relates to the pretreatment and digestion of the ore and separation of the red mud. Also included is the recovery of the spent liquor cycle stream.

### References

#### *Limiting references*

*This place does not cover:*

| | |
|---|---|
| Obtaining aluminium oxide or hydroxide from the resulting alkali metal aluminate solution | C01F 7/14 |

## C01F 7/0653

### characterised by the flocculant added to the slurry (final clarification of the aluminate solution C01F 7/47)

### Definition statement

*This place covers:*

The addition of agents for settling the red mud in Bayer process decanters.

### References

#### *Limiting references*

*This place does not cover:*

| | |
|---|---|
| The final clarification of aluminate solutions obtained from the settling tanks in the Bayer process: | C01F 7/47 |

## C01F 7/16

### Preparation of alkaline-earth metal aluminates or magnesium aluminates; Aluminium oxide or hydroxide therefrom (C01F 7/028 takes precedence)

### Definition statement

*This place covers:*

Compounds in which some of the phases are qualified as having the spinel structure.

### References

#### *Limiting references*

*This place does not cover:*

| | |
|---|---|
| Beta-aluminas | C01F 7/028 |

### Synonyms and Keywords

*In patent documents, the following words/expressions are often used with the meaning indicated:*

| | |
|---|---|
| Spinel | Alkaline earth metal aluminate, ($MgAl_2O_4$) |

## C01F 7/302

### Hydrolysis or oxidation of gaseous aluminium compounds in the gaseous phase

### Definition statement

*This place covers:*

Hydrolysis or oxidation of gaseous aluminium compounds in the gas phase, e.g. the oxidation of aluminium chloride in the gas phase.

### References

#### *Informative references*

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

| | |
|---|---|
| The conversion of hydrated aluminium chloride by heating in the gas phase (i.e. thermal decomposition) | C01F 7/306 |

## C01F 7/36

### from organic aluminium salts

#### Definition statement

*This place covers:*

E.g. the preparation of aluminium hydroxide from aluminium alkoxides in non-aqueous (e.g. alcoholic) solutions.

#### References

##### *Informative references*

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

| | |
|---|---|
| Sol-gel processing in general for the preparation of oxides: | C01B 13/32 |

#### Special rules of classification

The preparation of aluminum hydroxides $Al(OH)_3$ from salts other than organic salts (like aluminium sulfate or nitrate) is classified in C01F 7/34.

## C01F 7/78

### Compounds containing aluminium, with or without oxygen or hydrogen, and containing two or more other elements (aluminates C01F 7/02; compounds containing aluminium, fluorine and alkali or alkaline earth metals C01F 7/54; nitrates containing other cations besides aluminium C01F 7/66; sulfides, sulfites or sulfates containing other cations besides aluminium C01F 7/70 - C01F 7/74)

#### Definition statement

*This place covers:*

Compounds containing aluminium and two or more other elements, with the exception of oxygen and hydrogen are classified in this group.

#### References

##### *Limiting references*

*This place does not cover:*

| | |
|---|---|
| Aluminates | C01F 7/02 |
| Compounds containing aluminium, fluorine and alkali or alkaline earth metals | C01F 7/54 |
| Nitrates containing other cations besides aluminium | C01F 7/66 |
| Sulfides, sulfites or sulfates containing other cations besides aluminium | C01F 7/70-C01F 7/74 |

## C01F 7/785

### Hydrotalcite

#### Definition statement

*This place covers:*

Hydrotalcite $Mg_6Al_2CO_3(OH)_{16}\cdot 4(H_2O)$ is classified in this group.

## C01F 7/786

### containing, besides aluminium, only anions, e.g. $Al[OH]_xCl_y[SO_4]_z$ (mixed halides C01F 7/48)

#### Definition statement

*This place covers:*

Compounds comprising besides aluminium only anions, thereby not taken into account.

#### References

##### *Limiting references*

*This place does not cover:*

| | |
|---|---|
| Mixed halides | C01F 7/48 |

## C01F 11/00

### Compounds of calcium, strontium, or barium (C01F 7/00 takes precedence)

#### Definition statement

*This place covers:*

All compounds of calcium, strontium or barium except those with elements as such classified after C01F 11/00 and except those elements as specified in maingroup C01F 7/00.

#### References

##### *Limiting references*

*This place does not cover:*

| | |
|---|---|
| Compounds of calcium, strontium or barium with aluminium: | C01F 7/00, e.g. C01F 7/16 |

## C01F 11/185

### {After-treatment, e.g. grinding, purification, conversion of crystal morphology}

#### References

##### *Limiting references*

*This place does not cover:*

| | |
|---|---|
| Treatment of calcium carbonate for improving the pigmenting or filling properties (e.g. for application as filler in plastics or paper): | C09C 1/021 |

### Synonyms and Keywords

*In patent documents the following expressions are often used:*

| | |
|---|---|
| $CaCO_3$ | Calcite, aragonite, vaterite |

## C01F 11/46

### Sulfates (dehydration of gypsum {for the production of calcium sulfate cements} C04B 11/02)

### Definition statement

*This place covers:*

All forms of calcium sulfate, hydrated or free of crystal water

### References

#### *Limiting references*

*This place does not cover:*

| | |
|---|---|
| Dehydration of gypsum for the production of calcium sulfate cements: | C04B 11/02 |

### Synonyms and Keywords

*In patent documents, the following abbreviations are often used:*

| | |
|---|---|
| Gypsum | Dihydrate |

*In patent documents, the following words/expressions are often used with the meaning indicated:*

| | |
|---|---|
| Gypsum | $CaSO_4 \cdot 2H_2O$ |
| Calcium sulfate hemihydrate | $CaSO_4 \cdot 1/2H_2O$ |
| Anhydriite | $CaSO_4$ |

## C01F 11/466

### {Conversion of one form of calcium sulfate to another}

### Definition statement

*This place covers:*

All dehydrations, hydrations or conversions without a change in the water content, excluded the dehydration of the dihydrate (gypsum) into hemihydrate as part of the cement production (see below).

### References

#### *Limiting references*

*This place does not cover:*

| | |
|---|---|
| Dehydration of gypsum for the production of calcium sulfate cements: | C04B 11/02 |

## C01F 13/00

### Compounds of radium

### Definition statement

*This place covers:*

All compounds of radium except those with elements as such classified after C01F 13/00 and except those as specified after the subclass title C01F.

## C01F 15/00

### Compounds of thorium

### Definition statement

*This place covers:*

All compounds of thorium except those with elements as such classified after C01F 15/00 and except those as specified after the subclass title C01F.

## C01F 17/00

### Compounds of rare earth metals

### Definition statement

*This place covers:*

All compounds of rare earth metals, i.e. scandium, yttrium, lanthanum or the group of the lanthanides except those with elements as such classified after C01F 17/00.

### References

#### *Informative references*

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

| | |
|---|---|
| Abrasives consisting of rare earth metal compounds, e.g. ceria: | C09K 3/14 |