**CPC - COOPERATIVE PATENT CLASSIFICATION**

**C**  
CHEMISTRY; METALLURGY

*(NOTES omitted)*

**CHEMISTRY**

**C01**  
INORGANIC CHEMISTRY

*(NOTES omitted)*

**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})

- 1/00 Methods of preparing compounds of the metals beryllium, magnesium, aluminium, calcium, strontium, barium, radium, thorium, or the rare earths, in general
- 5/20 by precipitation from solutions of magnesium salts with ammonia
- 5/22 from magnesium compounds with alkali hydroxides or alkaline-earth oxides or hydroxides
- 5/24 Magnesium carbonates
- 5/26 Magnesium halides
- 5/28 Fluorides
- 5/30 Chlorides
- 5/305 {Dehydrating ammonium or alkali magnesium chlorides, e.g. carnalite}
- 5/32 Preparation of anhydrous magnesium chloride by chlorinating magnesium compounds
- 5/34 Dehydrating magnesium chloride containing water of crystallisation
- 5/36 Bromides
- 5/38 Magnesium nitrates
- 5/40 Magnesium sulfates (double sulfates of magnesium with sodium or potassium C01D 5/12, with other alkali metals C01D 15/00, C01D 17/00)
- 5/42 Magnesium sulfites

- 3/00 Compounds of beryllium
  - 3/005 {Fluorides or double fluorides of beryllium with alkali metals or ammonium; Preparation of beryllium compounds thereof}
  - 3/02 Oxides; Hydroxides

- 5/00 Compounds of magnesium
  - 5/02 Magnesia
  - 5/04 by oxidation of metallic magnesium
  - 5/06 by thermal decomposition of magnesium compounds (calcining magnesite or dolomite C04B 2/10)
  - 5/08 by calcining magnesium hydroxide
  - 5/10 by thermal decomposition of magnesium chloride with water vapour
  - 5/12 by thermal decomposition of magnesium sulfate, with or without reduction
  - 5/14 Magnesium hydroxide
  - 5/145 {Purification}
  - 5/16 by treating magnesia, e.g. calcined dolomite, with water or solutions of salts not containing magnesium

- 7/00 Compounds of aluminium
  - 7/001 {Aluminium carbonate}
Aluminates metals C01F 7/54 aluminium, fluorine and alkali or alkaline earth compounds containing sulfur and { Compounds containing, besides aluminium, aluminium oxide or hydroxide therefrom (taking precedence) }

Preparation of alkali metal aluminates; { Beta-aluminas } after-treatment of oxides or hydroxides {, e.g. dawsonite }

Aluminium oxide or hydroxide; Aluminates
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)}

Preparation of alkali metal aluminates; Aluminium oxide or hydroxide therefrom ({C01F 7/02 takes precedence})

[ Lithium aluminates]
[ Stabilisation of aluminates]

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)}

[Make-up of the alkali hydroxide solution from recycled spent liquor]
[ Precrushing of the minerals, e.g. grinding]

{ Processes making use of tube digestion only }
[ Characterised by the use of additives]

[Apparatus for digestion, e.g. digestor vessels, heat exchangers]
[ Separation of the insoluble residue, e.g. red mud]

{ Characterised by the flocculant added to the slurry (final clarification of the aluminate solution C01F 7/47) }
[ Treatment of the separated residue]

{ Process control or regulation (control per se G05) }
[ from phosphate-containing minerals]

[ from carbonate-containing minerals, e.g. dawsonite]
[ from sulfate-containing minerals, e.g. alunite]
[ from waste-like raw materials, e.g. fly ash, Bayer calcination dust]

by treating aluminous minerals with sodium carbonate {, e.g. sinter processes (C01F 7/0613 and C01F 7/066 take precedence) }

[according to the lime-sinter process]
by treating aluminous minerals with alkali sulfates and reducing agents

Alkali metal aluminates from alkaline-earth metal aluminates

7/14 . . . Aluminium oxide or hydroxide from alkali metal aluminates
7/141 . . . { from aqueous alminate solutions by neutralisation with an acidic agent }
7/142 . . . { with carbon dioxide }
7/144 . . . { from aqueous alminate solutions by precipitation due to cooling, e.g. as part of the Bayer process }
7/145 . . . { characterised by a crystal growth modifying agent other than aluminium hydroxide seed }
7/147 . . . { Apparatus for precipitation }
7/148 . . . { Separation of the obtained hydroxide, e.g. filtration, dewatering }
7/16 . . . Preparation of alkaline-earth metal aluminates (or magnesium aluminates); Aluminium oxide or hydroxide therefrom { (C01F 7/028 takes precedence) }
7/162 . . . { Magnesium aluminates }
7/164 . . . { Calcium aluminates }
7/166 . . . { Strontium aluminates }
7/168 . . . { Barium aluminates }
7/18 . . . Aluminium oxide or hydroxide from alkaline-earth metal aluminates
7/20 . . . Preparation of aluminium oxide or hydroxide from aluminous ores with acids or salts
7/22 . . . { with halides [or halogen acids] }
7/24 . . . { with nitric acid or nitrogen oxides }
7/26 . . . { with sulfuric acids or sulfates }
7/28 . . . { with sulfuric acid }
7/30 . . . Preparation of aluminium oxide or hydroxide by thermal decomposition { or by hydrolysis or oxidation } of aluminium compounds
7/302 . . . { Hydrolysis or oxidation of gaseous aluminium compounds in the gas phase }
7/304 . . . { of organic aluminium compounds }
7/306 . . . { Thermal decomposition of hydrated chlorides, e.g. aluminium trichloride hexahydrate }
7/308 . . . { Thermal decomposition of nitrates }
7/32 . . . { Thermal decomposition } of sulfates { including complex sulfates, e.g. alums }
7/34 . . . Preparation of aluminium hydroxide by precipitation from solutions containing aluminium salts
7/36 . . . from organic aluminium salts
7/38 . . . Preparation of aluminium oxide by thermal reduction of aluminous minerals
7/40 . . . in the presence of aluminium sulfide
7/42 . . . Preparation of aluminium oxide or hydroxide from metallic aluminium, e.g. by oxidation
7/422 . . . { by oxidation with a gaseous oxidizer at a high temperature }
7/424 . . . { using a plasma }
7/426 . . . { by applying mechanical energy to solid aluminium at a low temperature }
7/428 . . . { by oxidation in an aqueous solution }
7/44 . . . Dehydration of aluminium [oxide or] hydroxide {, i.e. all conversions of one form into another involving a loss of water } 
7/441 . . . { by calcination }
7/442 . . . { in presence of a calcination additive }
7/444 . . . { Apparatus therefor }
7/445 . . . { making use of a fluidised bed }
11/181 . . . [Preparation of calcium carbonate by carbonation of aqueous solutions and characterised by control of the carbonation conditions]
11/182 . . . [Preparation of calcium carbonate by carbonation of aqueous solutions and characterised by an additive other than CaCO₃-seeds]
11/183 . . . [the additive being an organic compound]
11/184 . . . [Preparation of calcium carbonate by carbonation of solutions based on non-aqueous solvents]
11/185 . . . [After-treatment, e.g. grinding, purification, conversion of crystal morphology]
11/186 . . . [Strontium or barium carbonate]
11/187 . . . [Strontium carbonate]
11/188 . . . [Barium carbonate]
11/20 . . . Halides
11/22 . . . Fluorides
11/24 . . . Chlorides
11/26 . . . from sulfides
11/28 . . . by chlorination of alkaline-earth metal compounds
11/30 . . . Concentrating; Dehydrating; Preventing the adsorption of moisture or caking
11/32 . . . Purification
11/34 . . . Bromides
11/36 . . . Nitrates
11/38 . . . Preparation with nitric acid or nitrogen oxides
11/40 . . . Preparation by double decomposition with nitrates
11/42 . . . Double salts (with magnesium C01F 5/28)
11/44 . . . Concentrating; Crystallising; Dehydrating; Preventing the absorption of moisture or caking
11/46 . . . Sulfates (dehydration of gypsum [for the production of calcium sulfate cements] C04B 11/02)
11/462 . . . [Sulfates of Sr or Ba]
11/464 . . . [Sulfates of Ca from gases containing sulfur oxides]
11/466 . . . [Conversion of one form of calcium sulfate to another]
11/468 . . . [Purification of calcium sulfates]
11/48 . . . Sulfites
13/00 Compounds of radium
15/00 Compounds of thorium
17/00 Compounds of rare earth metals

NOTES
1. In this group, the following expression is used with the meaning indicated; “rare earth metals” means elements from the group of the lanthanides as well as scandium or yttrium, taken alone or in combination.
2. When classifying a compound in groups C01F 17/20 - C01F 17/28, then its specific preparation or treatment must also be classified in groups C01F 17/10 - C01F 17/17 as long as the compound is characterised by its preparation or treatment and vice versa.
WARNING
Group C01F 17/00 is impacted by reclassification into group C01F 17/20.
Groups C01F 17/00 and C01F 17/20 should be considered in order to perform a complete search.

17/10 Preparation or treatment, e.g. separation or purification

WARNING
Group C01F 17/10 is impacted by reclassification into groups C01F 17/13 and C01F 17/17.
Groups C01F 17/10, C01F 17/13, and C01F 17/17 should be considered in order to perform a complete search.

17/13 by using ion exchange resins, e.g. chelate resins

WARNING
Group C01F 17/13 is incomplete pending reclassification of documents from group C01F 17/10.
Groups C01F 17/10 and C01F 17/13 should be considered in order to perform a complete search.

17/17 involving a liquid-liquid extraction

WARNING
Group C01F 17/17 is incomplete pending reclassification of documents from group C01F 17/10.
Groups C01F 17/10 and C01F 17/17 should be considered in order to perform a complete search.

17/20 Compounds containing only rare earth metals as the metal element

WARNING
Group C01F 17/20 is incomplete pending reclassification of documents from group C01F 17/00.
Groups C01F 17/00 and C01F 17/20 should be considered in order to perform a complete search.

17/206 oxide or hydroxide being the only anion

WARNING
Group C01F 17/206 is impacted by reclassification into groups C01F 17/212, C01F 17/218, C01F 17/224, C01F 17/229, C01F 17/235, and C01F 17/241.
All groups listed in this Warning should be considered in order to perform a complete search.

17/212 Scandium oxides or hydroxides

WARNING
Group C01F 17/212 is incomplete pending reclassification of documents from group C01F 17/206.
Groups C01F 17/206 and C01F 17/212 should be considered in order to perform a complete search.

17/218 Yttrium oxides or hydroxides

WARNING
Group C01F 17/218 is incomplete pending reclassification of documents from group C01F 17/206.
Groups C01F 17/206 and C01F 17/218 should be considered in order to perform a complete search.

17/224 Oxides or hydroxides of lanthanides

WARNING
Group C01F 17/224 is incomplete pending reclassification of documents from group C01F 17/206.
Groups C01F 17/206 and C01F 17/224 should be considered in order to perform a complete search.

17/229 Lanthanum oxides or hydroxides

WARNING
Group C01F 17/229 is incomplete pending reclassification of documents from group C01F 17/206.
Groups C01F 17/206 and C01F 17/229 should be considered in order to perform a complete search.

17/235 Cerium oxides or hydroxides

WARNING
Group C01F 17/235 is incomplete pending reclassification of documents from group C01F 17/206.
Groups C01F 17/206 and C01F 17/235 should be considered in order to perform a complete search.

17/241 containing two or more rare earth metals, e.g. NdPrO₃ or LaNdPrO₃

WARNING
Group C01F 17/241 is incomplete pending reclassification of documents from group C01F 17/206.
Groups C01F 17/206 and C01F 17/241 should be considered in order to perform a complete search.

17/247 Carbonates
17/253 . . Halides

**WARNING**

Group C01F 17/253 is impacted by reclassification into group C01F 17/259.

Groups C01F 17/253 and C01F 17/259 should be considered in order to perform a complete search.

17/259 . . Oxyhalides

**WARNING**

Group C01F 17/259 is incomplete pending reclassification of documents from group C01F 17/253.

Groups C01F 17/253 and C01F 17/259 should be considered in order to perform a complete search.

17/265 . . Fluorides
17/271 . . Chlorides
17/276 . . Nitrates
17/282 . . Sulfates
17/288 . . Sulfides
17/294 . . Oxysulfides
17/30 . Compounds containing rare earth metals and at least one element other than a rare earth metal, oxygen or hydrogen, e.g. La₃S₆Br₆ (C01F 17/247 - C01F 17/294 take precedence)
17/32 . oxide or hydroxide being the only anion, e.g. NaCeO₂ or Mg₃Ca₆EuO
17/34 . Aluminates, e.g. YAIO₃ or Y₃-xGdxAl₅O₁₂
17/36 . halogen being the only anion, e.g. NaYF₄
17/38 . sulfur being the only anion, e.g. CaLa₂S₄