

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
3/00	Compounds of beryllium	5/24	. Magnesium carbonates
3/005	. {Fluorides or double fluorides of beryllium with alkali metals or ammonium; Preparation of beryllium compounds therefrom}	5/26	. Magnesium halides
		5/28	. . Fluorides
3/02	. Oxides; Hydroxides	5/30	. . Chlorides
		5/305	. . . {Dehydrating ammonium or alkali magnesium chlorides, e.g. carnalite}
5/00	Compounds of magnesium	5/32	. . . Preparation of anhydrous magnesium chloride by chlorinating magnesium compounds
5/02	. Magnesia	5/34	. . . Dehydrating magnesium chloride containing water of crystallisation
5/04	. . by oxidation of metallic magnesium	5/36	. . Bromides
5/06	. . by thermal decomposition of magnesium compounds (calcining magnesite or dolomite C04B 2/10)	5/38	. Magnesium nitrates
5/08	. . . by calcining magnesium hydroxide	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)
5/10	. . . by thermal decomposition of magnesium chloride with water vapour		
5/12	. . . by thermal decomposition of magnesium sulfate, with or without reduction	5/42	. Magnesium sulfites
5/14	. Magnesium hydroxide		
5/145	. . {Purification}	7/00	Compounds of aluminium
5/16	. . by treating magnesia, e.g. calcined dolomite, with water or solutions of salts not containing magnesium	7/001	. {Aluminium carbonate}

- 7/002 . . {Compounds containing, besides aluminium, two or more other elements, with the exception of oxygen and hydrogen (compounds containing aluminium, fluorine and alkali or alkaline earth metals [C01F 7/54](#); compounds containing sulfur and other cations besides aluminium [C01F 7/68](#))}
- 7/004 . . {containing carbonate ions, e.g. dawsonite}
- 7/005 . . . {Hydrotalcite}
- 7/007 . . {containing, besides aluminium, only anions, e.g. $\text{Al(OH)}_x\text{CL}_y(\text{SO}_4)_z$ (mixed halides [C01F 7/48](#))}
- 7/008 . . {Ammonium aluminium fluorides}
- 7/02 . . Aluminium oxide; Aluminium hydroxide; Aluminates
- 7/021 . . {After-treatment of oxides or hydroxides}
- 7/022 . . . {Classification}
- 7/023 . . . {Grinding, deagglomeration, disintegration}
- 7/025 . . . {Granulation, agglomeration}
- 7/026 . . . {Making or stabilising dispersions}
- 7/027 . . . {Treatment involving fusion or vaporisation}
- 7/028 . . {Beta-aluminas}
- 7/04 . . Preparation of alkali metal aluminates; Aluminium oxide or hydroxide therefrom ([C01F 7/028](#) takes precedence)
- 7/043 . . . {Lithium aluminate}
- 7/046 . . . {Stabilisation of aluminates}
- 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](#))}
- 7/0606 {Make-up of the alkali hydroxide solution from recycled spent liquor}
- 7/0613 {Pretreatment of the minerals, e.g. grinding}
- 7/062 {Digestion}
- 7/0626 {Processes making use of tube digestion only}
- 7/0633 {characterised by the use of additives}
- 7/064 {Apparatus for digestion, e.g. digester vessels, heat exchangers}
- 7/0646 {Separation of the insoluble residue, e.g. red mud}
- 7/0653 {characterised by the flocculant added to the slurry (final clarification of the aluminate solution [C01F 7/47](#))}
- 7/066 {Treatment of the separated residue}
- 7/0666 {Process control or regulation ([control per se G05](#))}
- 7/0673 {from phosphate-containing minerals}
- 7/068 {from carbonate-containing minerals, e.g. dawsonite}
- 7/0686 {from sulfate-containing minerals, e.g. alunite}
- 7/0693 {from waste-like raw materials, e.g. fly ash, Bayer calcination dust}
- 7/08 . . . by treating aluminous minerals with sodium carbonate {, e.g. sinter processes ([C01F 7/0613](#) and [C01F 7/066](#) take precedence)}
- 7/085 {according to the lime-sinter process}
- 7/10 . . . by treating aluminous minerals with alkali sulfates and reducing agents
- 7/12 . . . Alkali metal aluminates from alkaline-earth metal aluminates
- 7/14 . . . Aluminium oxide or hydroxide from alkali metal aluminates
- 7/141 {from aqueous aluminate solutions by neutralisation with an acidic agent}
- 7/142 {with carbon dioxide}
- 7/144 {from aqueous aluminate 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 aluminate}; 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 sulfurous 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 oxidator 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}

- 7/447 . . . {by wet processes}
- 7/448 {using superatmospheric pressure, e.g. hydrothermal conversion of gibbsite into boehmite}
- 7/46 . . Purification of aluminium oxide, aluminium hydroxide or aluminates {(C01F 7/028 takes precedence)}
- 7/47 . . . of aluminates {, e.g. removal of compounds of Si, Fe, Ga or of organic compounds from Bayer process liquors}
- 7/473 {Removal of organic compounds, e.g. sodium oxalate}
- 7/476 {by oxidation}
- 7/48 . Aluminium halides
- 7/50 . . Fluorides
- 7/52 . . . Double compounds containing both fluorine and other acid {halide} groups
- 7/54 . . . Double compounds containing both aluminium and alkali metals or alkaline-earth metals
- 7/56 . . Chlorides (containing fluorine C01F 7/52)
- 7/58 . . . Preparation of anhydrous aluminium chloride
- 7/60 from oxygen-containing aluminium compounds
- 7/62 . . . Purification
- 7/64 . . Bromides (containing fluorine C01F 7/52)
- 7/66 . Aluminium nitrates (containing fluorine {C01F 7/002})
- 7/68 . Aluminium compounds containing sulfur (containing fluorine {C01F 7/002})
- 7/70 . . Sulfides
- 7/72 . . Sulfites
- 7/74 . . Sulfates
- 7/741 . . . {Preparation from elemental aluminium or elemental aluminium containing materials, e.g. foil, dross}
- 7/743 . . . {Preparation from silicoaluminous materials, e.g. clays, bauxite}
- 7/745 . . . {Preparation from alums, e.g. alunite}
- 7/746 . . . {After-treatment, e.g. dehydration, stabilisation}
- 7/748 {Purification}
- 7/76 . . . Double salts {, i.e. compounds containing, besides aluminium and sulfate ions, only other cations}, e.g. alums
- 7/762 {Ammonium or alkali metal aluminium sulfates}
- 7/765 {Ammonium aluminium sulfates}
- 7/767 {Alkaline earth metal aluminium sulfates}
- 11/00 Compounds of calcium, strontium, or barium (C01F 7/00 takes precedence)**
- 11/005 . {Preparation involving liquid-liquid extraction, absorption or ion-exchange}
- 11/02 . Oxides or hydroxides (production of lime C04B 2/00)
- 11/04 . . by thermal decomposition
- 11/06 . . . of carbonates
- 11/08 . . by reduction of sulfates
- 11/10 . . from sulfides
- 11/12 . . from silicates
- 11/16 . . Purification
- 11/18 . Carbonates
- 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 5/38)
- 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 17/38, 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*.

C01F

C01F 17/00
(continued)

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 . . . Oxsulfides

17/30 . Compounds containing rare earth metals and at least one element other than a rare earth metal, oxygen or hydrogen, e.g. $\text{La}_4\text{S}_3\text{Br}_6$
([C01F 17/247](#) - [C01F 17/294](#) take precedence)

17/32 . . oxide or hydroxide being the only anion, e.g. NaCeO_2 or $\text{Mg}_x\text{Ca}_y\text{EuO}$

17/34 . . . Aluminates, e.g. YAlO_3 or $\text{Y}_{3-x}\text{Gd}_x\text{Al}_5\text{O}_{12}$

17/36 . . halogen being the only anion, e.g. NaYF_4

17/38 . . sulfur being the only anion, e.g. CaLa_2S_4