

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	7/02	. Aluminium oxide; Aluminium hydroxide; Aluminates
		7/021	. . After-treatment of oxides or hydroxides
		7/022	. . . Classification
		7/023	. . . Grinding, deagglomeration or disintegration

- 7/025 . . . Granulation or 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 aluminates
- 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 Making-up 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 or heat exchangers
- 7/0646 Separation of the insoluble residue, e.g. of 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
- 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 or Bayer calcination dust
- 7/08 . . . by treating aluminous minerals with sodium carbonate, e.g. sinter processes ([C01F 7/0613, 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 the use of a crystal growth modifying agent other than aluminium hydroxide seed
- 7/147 Apparatus for precipitation
- 7/148 Separation of the obtained hydroxide, e.g. by filtration or 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 using 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 gaseous phase
- 7/304 of organic aluminium compounds
- 7/306 . . . Thermal decomposition of hydrated chlorides, e.g. of 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 . Halides, with or without other cations besides aluminium
- 7/50 . . Fluorides
- 7/52 . . . Double compounds containing both fluorine and other halide groups

- 7/54 . . . Double compounds containing both aluminium and alkali metals or alkaline-earth metals

- 7/56 . . Chlorides (containing fluorine [C01F 7/52](#))

WARNING

Group [C01F 7/56](#) is impacted by reclassification into group [C01F 7/57](#).

Groups [C01F 7/56](#) and [C01F 7/57](#) should be considered in order to perform a complete search.

- 7/57 . . . Basic aluminium chlorides, e.g. polyaluminium chlorides

WARNING

Group [C01F 7/57](#) is incomplete pending reclassification of documents from group [C01F 7/56](#).

Groups [C01F 7/56](#) and [C01F 7/57](#) should be considered in order to perform a complete search.

- 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 . Nitrates, with or without other cations besides aluminium

- 7/68 . Aluminium compounds containing sulfur

- 7/70 . . Sulfides

- 7/72 . . Sulfites

- 7/74 . . Sulfates

- 7/741 . . . Preparation from elemental aluminium or elemental aluminium containing materials, e.g. foil or dross

- 7/743 . . . Preparation from silicoaluminous materials, e.g. clays or bauxite

- 7/745 . . . Preparation from alums, e.g. alunite

- 7/746 . . . After-treatment, e.g. dehydration or 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

- 7/77 . Aluminium carbonates

- 7/78 . Compounds containing aluminium and two or more other elements, with the exception of oxygen and hydrogen (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](#))

WARNING

Group [C01F 7/78](#) is impacted by reclassification into group [C01F 7/784](#).

Groups [C01F 7/78](#) and [C01F 7/784](#) should be considered in order to perform a complete search.

- 7/782 . . containing carbonate ions, e.g. dawsonite

WARNING

Group [C01F 7/782](#) is impacted by reclassification into group [C01F 7/784](#).

Groups [C01F 7/782](#) and [C01F 7/784](#) should be considered in order to perform a complete search.

- 7/784 . . Layered double hydroxide, e.g. comprising nitrate, sulfate or carbonate ions as intercalating anions

WARNING

Group [C01F 7/784](#) is incomplete pending reclassification of documents from groups [C01F 7/78](#) and [C01F 7/782](#).

Groups [C01F 7/78](#), [C01F 7/782](#) and [C01F 7/784](#) should be considered in order to perform a complete search.

- 7/785 . . . Hydrotalcite

- 7/786 . . containing, besides aluminium, only anions, e.g. $\text{Al}[\text{OH}]_x\text{Cl}_y[\text{SO}_4]_z$ (mixed halides [C01F 7/48](#))

- 7/788 . . Ammonium aluminium fluorides, e.g. ammonium hexafluoroaluminate

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 CaCO_3 -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 . Sulfitess
- 17/247 . . Carbonates
- 17/253 . . Halides
- 17/259 . . . Oxyhalides
- 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. $\text{La}_4\text{S}_3\text{Br}_6$ ([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

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*.

- 17/10 . Preparation or treatment, e.g. separation or purification
- 17/13 . . by using ion exchange resins, e.g. chelate resins
- 17/17 . . involving a liquid-liquid extraction
- 17/20 . Compounds containing only rare earth metals as the metal element
- 17/206 . . oxide or hydroxide being the only anion
- 17/212 . . . Scandium oxides or hydroxides
- 17/218 . . . Yttrium oxides or hydroxides
- 17/224 . . . Oxides or hydroxides of lanthanides
- 17/229 Lanthanum oxides or hydroxides
- 17/235 Cerium oxides or hydroxides
- 17/241 . . . containing two or more rare earth metals, e.g. NdPrO_3 or LaNdPrO_3