

# 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
3/00	Compounds of beryllium	5/22	. . from magnesium compounds with alkali hydroxides or alkaline- earth oxides or hydroxides
3/005	. {Fluorides or double fluorides of beryllium with alkali metals or ammonium; Preparation of beryllium compounds therefrom}	5/24	. Magnesium carbonates
3/02	. Oxides; Hydroxides	5/26	. Magnesium halides
5/00	Compounds of magnesium	5/28	. . Fluorides
5/02	. Magnesia	5/30	. . Chlorides
5/04	. . by oxidation of metallic magnesium	5/305	. . . {Dehydrating ammonium or alkali magnesium chlorides, e.g. carnalite}
5/06	. . by thermal decomposition of magnesium compounds (calcining magnesite or dolomite <a href="#">C04B 2/10</a> )	5/32	. . . Preparation of anhydrous magnesium chloride by chlorinating magnesium compounds
5/08	. . . by calcining magnesium hydroxide	5/34	. . . Dehydrating magnesium chloride containing water of crystallisation
5/10	. . . by thermal decomposition of magnesium chloride with water vapour	5/36	. . Bromides
5/12	. . . by thermal decomposition of magnesium sulfate, with or without reduction	5/38	. Magnesium nitrates
5/14	. Magnesium hydroxide	5/40	. Magnesium sulfates (double sulfates of magnesium with sodium or potassium <a href="#">C01D 5/12</a> , with other alkali metals { <a href="#">C01D 15/00</a> }, <a href="#">C01D 17/00</a> )
5/145	. . {Purification}	5/42	. Magnesium sulfites
5/16	. . by treating magnesia, e.g. calcined dolomite, with water or solutions of salts not containing magnesium	7/00	Compounds of aluminium
		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	11/181	. . . {Preparation of calcium carbonate by carbonation of aqueous solutions and characterised by control of the carbonation conditions}
7/56	. . Chlorides (containing fluorine C01F 7/52)	11/182	. . . {Preparation of calcium carbonate by carbonation of aqueous solutions and characterised by an additive other than CaCO <sub>3</sub> -seeds}
7/57	. . . Basic aluminium chlorides, e.g. polyaluminium chlorides	11/183	. . . {the additive being an organic compound}
7/58	. . . Preparation of anhydrous aluminium chloride	11/184	. . . {Preparation of calcium carbonate by carbonation of solutions based on non-aqueous solvents}
7/60	. . . . from oxygen-containing aluminium compounds	11/185	. . . {After-treatment, e.g. grinding, purification, conversion of crystal morphology}
7/62	. . . Purification	11/186	. . . {Strontium or barium carbonate}
7/64	. . Bromides (containing fluorine C01F 7/52)	11/187	. . . {Strontium carbonate}
7/66	. Nitrates, with or without other cations besides aluminium	11/188	. . . {Barium carbonate}
7/68	. Aluminium compounds containing sulfur	11/20	. Halides
7/70	. . Sulfides	11/22	. . Fluorides
7/72	. . Sulfites	11/24	. . Chlorides
7/74	. . Sulfates	11/26	. . . from sulfides
7/741	. . . Preparation from elemental aluminium or elemental aluminium containing materials, e.g. foil or dross	11/28	. . . by chlorination of alkaline-earth metal compounds
7/743	. . . Preparation from silicoaluminous materials, e.g. clays or bauxite	11/30	. . . Concentrating; Dehydrating; Preventing the adsorption of moisture or caking
7/745	. . . Preparation from alums, e.g. alunite	11/32	. . . Purification
7/746	. . . After-treatment, e.g. dehydration or stabilisation	11/34	. . Bromides
7/748	. . . . Purification	11/36	. Nitrates
7/76	. . . Double salts, i.e. compounds containing, besides aluminium and sulfate ions, only other cations, e.g. alums	11/38	. . Preparation with nitric acid or nitrogen oxides
7/762	. . . . Ammonium or alkali metal aluminium sulfates	11/40	. . Preparation by double decomposition with nitrates
7/765	. . . . . Ammonium aluminium sulfates	11/42	. . Double salts (with magnesium C01F 5/38)
7/767	. . . . Alkaline earth metal aluminium sulfates	11/44	. . Concentrating; Crystallising; Dehydrating; Preventing the absorption of moisture or caking
7/77	. Aluminium carbonates	11/46	. Sulfates (dehydration of gypsum {for the production of calcium sulfate cements} C04B 11/02)
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)	11/462	. . {Sulfates of Sr or Ba}
7/782	. . containing carbonate ions, e.g. dawsonite	11/464	. . {Sulfates of Ca from gases containing sulfur oxides}
7/784	. . Layered double hydroxide, e.g. comprising nitrate, sulfate or carbonate ions as intercalating anions	11/466	. . {Conversion of one form of calcium sulfate to another}
7/785	. . . Hydrotalcite	11/468	. . {Purification of calcium sulfates}
7/786	. . containing, besides aluminium, only anions, e.g. Al(OH) <sub>x</sub> Cl <sub>y</sub> [SO <sub>4</sub> ] <sub>z</sub> (mixed halides C01F 7/48)	11/48	. Sulfites
7/788	. . Ammonium aluminium fluorides, e.g. ammonium hexafluoroaluminate	13/00	<b>Compounds of radium</b>
11/00	<b>Compounds of calcium, strontium, or barium (C01F 7/00 takes precedence)</b>	15/00	<b>Compounds of thorium</b>
11/005	. . {Preparation involving liquid-liquid extraction, absorption or ion-exchange}	17/00	<b>Compounds of rare earth metals</b>
11/02	. Oxides or hydroxides (production of lime C04B 2/00)		<b>NOTES</b>
11/04	. . by thermal decomposition		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.
11/06	. . . of carbonates		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 <i>vice versa</i> .
11/08	. . by reduction of sulfates	17/10	. Preparation or treatment, e.g. separation or purification
11/10	. . from sulfides	17/13	. . by using ion exchange resins, e.g. chelate resins
11/12	. . from silicates	17/17	. . involving a liquid-liquid extraction
11/16	. . Purification		
11/18	. Carbonates		

## C01F

- 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.  $\text{NdPrO}_3$  or  $\text{LaNdPrO}_3$
- 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 . . . 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.  $\text{NaCeO}_2$  or  $\text{Mg}_x\text{Ca}_y\text{EuO}$
- 17/34 . . . Aluminates, e.g.  $\text{YAlO}_3$  or  $\text{Y}_{3-x}\text{Gd}_x\text{Al}_5\text{O}_{12}$
- 17/36 . . halogen being the only anion, e.g.  $\text{NaYF}_4$
- 17/38 . . sulfur being the only anion, e.g.  $\text{CaLa}_2\text{S}_4$