**COOPERATIVE PATENT CLASSIFICATION**

**CHEMISTRY; METALLURGY**  
*(NOTES omitted)*

**CHEMISTRY**

**C01**  
**INORGANIC CHEMISTRY** (processing powders of inorganic compounds preparatory to the manufacturing of ceramic products **C04B 35/00**; fermentation or enzyme-using processes for the preparation of elements or inorganic compounds except carbon dioxide **C12P 3/00**; obtaining metal compounds from mixtures, e.g. ores, which are intermediate compounds in a metallurgical process for obtaining a free metal **C21B, C22B**; production of non-metallic elements or inorganic compounds by electrolysis or electrophoresis **C25B**)  
*(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 peroxycacids **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**; 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 3/20**; 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 |
| 3/00 | Compounds of beryllium |
| 3/005 | . (Fluorides or double fluorides of beryllium with alkali metals or ammonium; Preparation of beryllium compounds therefrom) |
| 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 |
| 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 |
Compounds of aluminium

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. Al(OH)xCLy(SO4)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 from the resulting aluminate solution (C01F 7/47 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 . . . . . . [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. digestor 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 C01G5)]
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 alkali-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 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 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]
Compounds of calcium, strontium, or barium

- Dehydration of aluminium [oxide or] hydroxide [i.e. all conversions of one form into another involving a loss of water]
- [by calcination]
- [in presence of a calcination additive]
- [Apparatus therefor]
- [making use of a fluidised bed]
- [by wet processes]
- [using superatmospheric pressure, e.g. hydrothermal conversion of gibbsite into boehmite]
- Purification of aluminium oxide, aluminium hydroxide or aluminates (C01F 7/028 takes precedence)
- of aluminates [e.g. removal of compounds of Si, Fe, Ga or of organic compounds from Bayer process liquors]
- [Removal of organic compounds, e.g. sodium oxalate]
- [by oxidation]
- Aluminium halides
- Fluorides
- Double compounds containing both fluorine and other acid [halide] groups
- Double compounds containing both aluminium and alkali metals or alkaline-earth metals
- Chlorides (containing fluorine C01F 7/52)
- Preparation of anhydrous aluminium chloride
- from oxygen-containing aluminium compounds
- Purification
- Bromides (containing fluorine C01F 7/52)
- Aluminium nitrates (containing fluorine C01F 7/02)
- Aluminium compounds containing sulfur (containing fluorine C01F 7/002)
- Sulfides
- Sulfites
- Sulfates
- [Preparation from elemental aluminium or elemental aluminium containing materials, e.g. foil, dross]
- [Preparation from silicoaluminous materials, e.g. clays, bauxite]
- [Preparation from alums, e.g. alumine]
- [After-treatment, e.g. dehydration, stabilisation]
- [Purification]
- Double salts [i.e. compounds containing, besides aluminium and sulfate ions, only other cations], e.g. alums
- [Ammonium or alkali metal aluminium sulfates]
- [Ammonium aluminium sulfates]
- [Alkaline earth metal aluminium sulfates]

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

- [Preparation involving liquid-liquid extraction, absorption or ion-exchange]
- Oxides or hydroxides (production of lime C04B 2/00)
- by thermal decomposition
- of carbonates
- by reduction of sulfates
- from sulfides
- from silicates
- Purification
- Carbonates
- [Preparation of calcium carbonate by conversion of aqueous solutions and characterised by control of the carbonation conditions]
- [Preparation of calcium carbonate by conversion of aqueous solutions and characterised by an additive other than CaCO$_3$-seeds]
- [the additive being an organic compound]
- [Preparation of calcium carbonate by conversion of solutions based on non-aqueous solvents]
- [After-treatment, e.g. grinding, purification, conversion of crystal morphology]
- [Strontium or barium carbonate]
- [Strontium carbonate]
- [Barium carbonate]
- Halides
- Fluorides
- Chlorides
- from sulfides
- by chlorination of alkaline-earth metal compounds
- Concentrating; Dehydrating; Preventing the adsorption of moisture or caking
- Purification
- Bromides
- Nitrates
- Preparation with nitric acid or nitrogen oxides
- Preparation by double decomposition with nitrates
- Double salts (with magnesium C01F 5/38)
- [Concentrating; Crystallisating; Dehydrating; Preventing the absorption of moisture or caking]
- Sulfates (dehydration of gypsum [for the production of calcium sulfate cements]) C04B 11/02
- [Sulfates of Sr or Ba]
- [Sulfates of Ca from gases containing sulfur oxides]
- [Conversion of one form of calcium sulfate to another]
- [Purification of calcium sulfates]
- Sulfites

Compounds of radium

Compounds of thorium

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

**NOTE**

In this group "rare earth metals" means one single element or a combination of elements taken from the group as specified above

- Preparation involving a liquid-liquid extraction, an adsorption or an ion exchange
- Compounds containing, besides rare earth metals, two or more other elements with the exception of oxygen or hydrogen, e.g. La$_2$Si$_3$Br$_6$, or ternary oxides or hydroxides, e.g. NaCeO$_3$}
Oxygen being the only anion

Aluminates

Halogen being the only anion (compounds containing besides rare earth metals only different halogens, e.g. ScCl$_3$F)

Sulfur being the only anion

Sulfur being the only anion (compounds containing besides rare earth metals only different halogens, e.g. ScCl$_3$F)

Carbonates

Halides

Fluorides

Chlorides

Nitrates

Sulfates

Sulfides

Oxysulfides