

CPC**COOPERATIVE PATENT CLASSIFICATION****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 31/30](#); 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](#) })

C01F 1/00

Methods of preparing compounds of the metals beryllium, magnesium, aluminium, calcium, strontium, barium, radium, thorium, or the rare earths, in general

C01F 3/00

Compounds of beryllium

C01F 3/005

- . {Fluorides or double fluorides of beryllium with alkali metals or ammonium; Preparation of beryllium compounds therefrom }

C01F 3/02

- . Oxides; Hydroxides

C01F 5/00

Compounds of magnesium

C01F 5/02

- . Magnesia

C01F 5/04

- .. by oxidation of metallic magnesium

C01F 5/06

- .. by thermal decomposition of magnesium compounds (calcining magnesite or dolomite [C04B 2/10](#))

C01F 5/08

- ... by calcining magnesium hydroxide

C01F 5/10

- ... by thermal decomposition of magnesium chloride with water vapour

C01F 5/12

- ... by thermal decomposition of magnesium sulfate, with or without reduction

C01F 5/14

- . Magnesium hydroxide

C01F 5/145

- .. {Purification }

C01F 5/16

- .. by treating magnesia, e.g. calcined dolomite, with water or solutions of salts not containing magnesium

- C01F 5/20 . . by precipitation from solutions of magnesium salts with ammonia
- C01F 5/22 . . from magnesium compounds with alkali hydroxides or alkaline- earth oxides or hydroxides
- C01F 5/24 . Magnesium carbonates
- C01F 5/26 . Magnesium halides
- C01F 5/28 . . Fluorides
- C01F 5/30 . . Chlorides
- C01F 5/305 . . . {Dehydrating ammonium or alkali magnesium chlorides, e.g. carnalite }
- C01F 5/32 . . . Preparation of anhydrous magnesium chloride by chlorinating magnesium compounds
- C01F 5/34 . . . Dehydrating magnesium chloride containing water of crystallisation
- C01F 5/36 . . Bromides
- C01F 5/38 . Magnesium nitrates
- C01F 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](#))
- C01F 5/42 . Magnesium sulfites
- C01F 7/00** **Compounds of aluminium**
- C01F 7/001 . {Aluminium carbonate }
- C01F 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](#)) }
- C01F 7/004 . . {containing carbonate ions, e.g. dawsonite }
- C01F 7/005 . . . {Hydrotalcite }
- C01F 7/007 . . {containing, besides aluminium, only anions, e.g. $\text{Al}(\text{OH})_x\text{CL}_y(\text{SO}_4)_z$ (mixed halides [C01F 7/48](#)) }
- C01F 7/008 . . {Ammonium aluminium fluorides }
- C01F 7/02 . Aluminium oxide; Aluminium hydroxide; Aluminates
- C01F 7/021 . . {After-treatment of oxides or hydroxides }
- C01F 7/022 . . . {Classification }
- C01F 7/023 . . . {Grinding, deagglomeration, disintegration }
- C01F 7/025 . . . {Granulation, agglomeration }
- C01F 7/026 . . . {Making or stabilising dispersions }
- C01F 7/027 . . . {Treatment involving fusion or vaporisation }
- C01F 7/028 . . {Beta-aluminas }
- C01F 7/04 . . Preparation of alkali metal aluminates; Aluminium oxide or hydroxide therefrom { [C01F 7/028](#) takes precedence } }
- C01F 7/043 . . . {Lithium aluminate }

C01F 7/046	...	{Stabilisation of aluminates }
C01F 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) }
C01F 7/0606	....	{Make-up of the alkali hydroxide solution from recycled spent liquor }
C01F 7/0613	....	{Pretreatment of the minerals, e.g. grinding }
C01F 7/062	....	{Digestion }
C01F 7/0626	.....	{Processes making use of tube digestion only }
C01F 7/0633	.....	{characterised by the use of additives }
C01F 7/064	.....	{Apparatus for digestion, e.g. digester vessels, heat exchangers }
C01F 7/0646	....	{Separation of the insoluble residue, e.g. red mud }
C01F 7/0653	.....	{characterised by the flocculant added to the slurry (final clarification of the aluminate solution C01F 7/47) }
C01F 7/066	....	{Treatment of the separated residue }
C01F 7/0666	....	{Process control or regulation (control per se G05) }
C01F 7/0673	....	{from phosphate-containing minerals }
C01F 7/068	....	{from carbonate-containing minerals, e.g. dawsonite }
C01F 7/0686	....	{from sulfate-containing minerals, e.g. alunite }
C01F 7/0693	....	{from waste-like raw materials, e.g. fly ash, Bayer calcination dust }
C01F 7/08	...	by treating aluminous minerals with sodium carbonate, {e.g. sinter processes (C01F 7/0613 and C01F 7/066 take precedence) }
C01F 7/085	....	{according to the lime-sinter process }
C01F 7/10	...	by treating aluminous minerals with alkali sulfates and reducing agents
C01F 7/12	...	Alkali metal aluminates from alkaline-earth metal aluminates
C01F 7/14	...	Aluminium oxide or hydroxide from alkali metal aluminates
C01F 7/141	....	{from aqueous aluminate solutions by neutralisation with an acidic agent }
C01F 7/142	.....	{with carbon dioxide }
C01F 7/144	....	{from aqueous aluminate solutions by precipitation due to cooling, e.g. as part of the Bayer process }
C01F 7/145	.....	{characterised by a crystal growth modifying agent other than aluminium hydroxide seed }
C01F 7/147	.....	{Apparatus for precipitation }
C01F 7/148	.....	{Separation of the obtained hydroxide, e.g. filtration, dewatering }
C01F 7/16	..	Preparation of alkaline-earth metal aluminates {or magnesium aluminate }; Aluminium oxide or hydroxide therefrom { (C01F 7/028 takes precedence) }
C01F 7/162	...	{Magnesium aluminates }
C01F 7/164	...	{Calcium aluminates }
C01F 7/166	...	{Strontium aluminates }
C01F 7/168	...	{Barium aluminates }
C01F 7/18	...	Aluminium oxide or hydroxide from alkaline-earth metal aluminates
C01F 7/20	..	Preparation of aluminium oxide or hydroxide from aluminous ores with acids or salts
C01F 7/22	...	with halides { or halogen acids }
C01F 7/24	...	with nitric acid or nitrogen oxides

C01F 7/26	...	with sulfuric acids or sulfates
C01F 7/28	...	with sulfurous acid
C01F 7/30	..	Preparation of aluminium oxide or hydroxide by thermal decomposition {or by hydrolysis or oxidation } of aluminium compounds
C01F 7/302	...	{Hydrolysis or oxidation of gaseous aluminium compounds in the gas phase }
C01F 7/304	....	{of organic aluminium compounds }
C01F 7/306	...	{Thermal decomposition of hydrated chlorides, e.g. aluminium trichloride hexahydrate }
C01F 7/308	...	{Thermal decomposition of nitrates }
C01F 7/32	...	{Thermal decomposition } of sulfates {including complex sulfates, e.g. alums }
C01F 7/34	..	Preparation of aluminium hydroxide by precipitation from solutions containing aluminium salts
C01F 7/36	...	from organic aluminium salts
C01F 7/38	..	Preparation of aluminium oxide by thermal reduction of aluminous minerals
C01F 7/40	...	in the presence of aluminium sulfide
C01F 7/42	..	Preparation of aluminium oxide or hydroxide from metallic aluminium, e.g. by oxidation
C01F 7/422	...	{by oxidation with a gaseous oxidator at a high temperature }
C01F 7/424	....	{using a plasma }
C01F 7/426	...	{by applying mechanical energy to solid aluminium at a low temperature }
C01F 7/428	...	{by oxidation in an aqueous solution }
C01F 7/44	..	Dehydration of aluminium {oxide or } hydroxide, {i.e. all conversions of one form into another involving a loss of water }
C01F 7/441	...	{by calcination }
C01F 7/442	....	{in presence of a calcination additive }
C01F 7/444	....	{Apparatus therefor }
C01F 7/445	....	{making use of a fluidised bed }
C01F 7/447	...	{by wet processes }
C01F 7/448	....	{using superatmospheric pressure, e.g. hydrothermal conversion of gibbsite into boehmite }
C01F 7/46	..	Purification of aluminium oxide, aluminium hydroxide or aluminates { (7/02H takes precedence) }
C01F 7/47	...	of aluminates, {e.g. removal of compounds of Si, Fe, Ga or of organic compounds from Bayer process liquors }
C01F 7/473	....	{Removal of organic compounds, e.g. sodium oxalate }
C01F 7/476	.....	{by oxidation }
C01F 7/48	.	Aluminium halides
C01F 7/50	..	Fluorides
C01F 7/52	...	Double compounds containing both fluorine and other acid { halide } groups
C01F 7/54	...	Double compounds containing both aluminium and alkali metals or alkaline-earth metals
C01F 7/56	..	Chlorides (containing fluorine C01F 7/52)
C01F 7/58	...	Preparation of anhydrous aluminium chloride
C01F 7/60	....	from oxygen-containing aluminium compounds

- C01F 7/62 . . . Purification
- C01F 7/64 . . Bromides (containing fluorine [C01F 7/52](#))
- C01F 7/66 . Aluminium nitrates (containing fluorine [C01F 7/002](#))
- C01F 7/68 . Aluminium compounds containing sulfur (containing fluorine [C01F 7/002](#))
- C01F 7/70 . . Sulfides
- C01F 7/72 . . Sulfites
- C01F 7/74 . . Sulfates
- C01F 7/741 . . . {Preparation from elemental aluminium or elemental aluminium containing materials, e.g. foil, dross }
- C01F 7/743 . . . {Preparation from silicoaluminous materials, e.g. clays, bauxite }
- C01F 7/745 . . . {Preparation from alums, e.g. alunite }
- C01F 7/746 . . . {After-treatment, e.g. dehydration, stabilisation }
- C01F 7/748 {Purification }
- C01F 7/76 . . . Double salts, {i.e. compounds containing, besides aluminium and sulfate ions, only other cations }, e.g. alums
- C01F 7/762 {Ammonium or alkali metal aluminium sulfates }
- C01F 7/765 {Ammonium aluminium sulfates }
- C01F 7/767 {Alkaline earth metal aluminium sulfates }
- C01F 11/00** **Compounds of calcium, strontium, or barium ([C01F 7/00](#) takes precedence)**
- C01F 11/005 . {Preparation involving liquid-liquid extraction, absorption or ion-exchange }
- C01F 11/02 . Oxides or hydroxides (production of lime [C04B 2/00](#))
- C01F 11/04 . . by thermal decomposition
- C01F 11/06 . . . of carbonates
- C01F 11/08 . . by reduction of sulfates
- C01F 11/10 . . from sulfides
- C01F 11/12 . . from silicates
- C01F 11/16 . . Purification
- C01F 11/18 . Carbonates
- C01F 11/181 . . {Preparation of calcium carbonate by carbonation of aqueous solutions and characterised by control of the carbonation conditions }
- C01F 11/182 . . {Preparation of calcium carbonate by carbonation of aqueous solutions and characterised by an additive other than CaCO₃-seeds }
- C01F 11/183 . . . {the additive being an organic compound }
- C01F 11/184 . . {Preparation of calcium carbonate by carbonation of solutions based on non-aqueous solvents }
- C01F 11/185 . . {After-treatment, e.g. grinding, purification, conversion of crystal morphology }
- C01F 11/186 . . {Strontium or barium carbonate }
- C01F 11/187 . . . {Strontium carbonate }
- C01F 11/188 . . . {Barium carbonate }

C01F 11/20	. Halides
C01F 11/22	.. Fluorides
C01F 11/24	.. Chlorides
C01F 11/26	... from sulfides
C01F 11/28	... by chlorination of alkaline-earth metal compounds
C01F 11/30	... Concentrating; Dehydrating; Preventing the adsorption of moisture or caking
C01F 11/32	... Purification
C01F 11/34	.. Bromides
C01F 11/36	. Nitrates
C01F 11/38	.. Preparation with nitric acid or nitrogen oxides
C01F 11/40	.. Preparation by double decomposition with nitrates
C01F 11/42	.. Double salts (with magnesium C01F 5/38)
C01F 11/44	.. Concentrating; Crystallising; Dehydrating; Preventing the absorption of moisture or caking
C01F 11/46	. Sulfates (dehydration of gypsum {for the production of calcium sulfate cements } C04B 11/02)
C01F 11/462	.. {Sulfates of Sr or Ba }
C01F 11/464	.. {Sulfates of Ca from gases containing sulfur oxides }
C01F 11/466	.. {Conversion of one form of calcium sulfate to another }
C01F 11/468	.. {Purification of calcium sulfates }
C01F 11/48	. Sulfites
C01F 13/00	Compounds of radium
C01F 15/00	Compounds of thorium
C01F 17/00	Compounds of the rare earth metals, i.e. scandium, yttrium, lanthanum, or the group of the lanthanides
	<u>NOTE</u>
	In this group "rare earth metals" means one single element or a combination of elements taken from the group as specified above
C01F 17/0006	. {Preparation involving a liquid-liquid extraction, an adsorption or an ion exchange }
C01F 17/0012	. {Compounds containing besides rare earth metals two or more other element with the exception of oxygen or hydrogen, e.g. La ₄ S ₃ Br ₆ or ternary oxides or hydroxides, e.g. NaCeO ₂ }
C01F 17/0018	.. {Oxygen being the only anion }
C01F 17/0025	... {Aluminates }
C01F 17/0031	.. {Halogen being the only anion (compounds containing besides rare earth metals

- only different halogens, e.g. Sc [C01F 17/0056](#) }
- C01F 17/0037 . . {Sulfur being the only anion }
- C01F 17/0043 . {Oxides or hydroxides (ternary oxides or hydroxides, e.g. NaCeO₂ [C01F 17/0018](#)) }
- C01F 17/005 . {Carbonates }
- C01F 17/0056 . {Halides }
- C01F 17/0062 . . {Fluorides }
- C01F 17/0068 . . {Chlorides }
- C01F 17/0075 . {Nitrates }
- C01F 17/0081 . {Sulfates }
- C01F 17/0087 . {Sulfides }
- C01F 17/0093 . . {Oxysulfides }