SECTION B — PERFORMING OPERATIONS; TRANSPORTING

B01 PHYSICAL OR CHEMICAL PROCESSES OR APPARATUS IN GENERAL

B01J CHEMICAL OR PHYSICAL PROCESSES, e.g. CATALYSIS, COLLOID CHEMISTRY; THEIR RELEVANT APPARATUS (processes or apparatus for specific applications, see the relevant places for these processes or apparatus, e.g. F26B 3/08) **[2]**

Note(s)

1. In this subclass, the following terms or expressions are used with the meanings indicated:
   - "solid particles" includes such particles whether catalysts, reactants or inert in solid, semi-solid or pasty state;
   - "fluidised particles" means finely divided solid particles lifted and agitated by a stream of fluid;
   - "fluidised-bed technique" means fluid-solid contacting technique in which finely divided particles are lifted and agitated by a rising stream of fluid, said stream having such a speed as to form a lower dense phase (the "bed") and an upper dilute fluidised phase of "fluidised particles";
   - "processes conducted in the presence of solid particles" does not include processes wherein the only solid particles present are formed during the reaction.
2. In this subclass, tradenames that are often found in scientific and patent literature have been used in order to define precisely the scope of the groups.

Subclass index

CHEMICAL, PHYSICAL, OR PHYSICO-CHEMICAL PROCESSES OR APPARATUS.....3/00, 4/00, 6/00, 7/00, 8/00, 19/00
CHEMICAL PROCESSES INVOLVING A GAS.....8/00, 10/00, 12/00, 15/00
CHEMICAL PROCESSES INVOLVING A LIQUID.....8/00, 10/00, 14/00, 16/00
CATALYSTS
containing elements or inorganic compounds.....21/00, 23/00, 27/00
Raney type.....25/00
Molecular sieves.....29/00
containing hydrides, coordination complexes or organic compounds.....31/00
Catalyst carriers in general.....32/00
Preparation.....33/00-37/00
Regeneration or reactivation of catalysts, in general.....38/00
SORBENT, FILTER AID COMPOSITIONS.....20/00
ION EXCHANGE PROCESSES.....39/00-49/00
COLLOID CHEMISTRY.....13/00
GRANULATION.....2/00

2/00 Processes or devices for granulating materials, in general (granulating metals B22F 9/00, slag C04B 5/02, ores or scrap C22B 1/14; mechanical aspects of working of plastics or substances in a plastic state to make granules B29B 9/00; processes for granulating fertilisers characterised by their chemical constitution, see the relevant groups in C05B-C05G; chemical aspects of powdering or granulating of macromolecular substances C08J 3/12)**; Rendering particulate materials free flowing in general, e.g. making them hydrophobic [4]**

2/02 • by dividing the liquid material into drops, e.g. by spraying, and solidifying the drops (evaporating by spraying B01D 1/16)

2/04 • • in a gaseous medium

2/06 • • in a liquid medium

2/08 • • • Gelation of a colloidal solution

2/10 • in stationary drums or troughs, provided with kneading or mixing appliances

2/12 • in rotating drums

2/14 • in rotating dishes or pans

2/16 • by suspending the powder material in a gas, e.g. in fluidised beds or as a falling curtain

2/18 • using a vibrating apparatus

2/20 • by expressing the material, e.g. through sieves and fragmenting the extruded length

2/22 • by pressing in moulds or between rollers

2/24 • Obtaining flakes by scraping a solid layer from a surface

2/26 • on endless conveyor belts

2/28 • using special binding agents

2/30 • using agents to prevent the granules sticking together; Rendering particulate materials free flowing in general, e.g. making them hydrophobic **[4]**

3/00 **Processes of utilising sub-atmospheric or super-atmospheric pressure to effect chemical or physical change of matter; Apparatus therefor** (apparatus for compacting or sintering of metal powders B22F 3/00; pressure vessels in general F16J 12/00; pressure vessels for containing or storing compressed, liquefied or solidified gases F17C; pressure vessels for nuclear reactors G21C) **[2]**

3/02 • Feed or outlet devices therefor

3/03 • Pressure vessels, or vacuum vessels, having closure members or seals specially adapted therefor **[3]**

3/04 • Pressure vessels, e.g. autoclaves **[2]**

3/06 • Processes using ultra-high pressure, e.g. for the formation of diamonds; Apparatus therefor, e.g. moulds, dies (B01J 3/04 takes precedence; presses in general B30B) **[2]**

3/08 • • Application of shock waves for chemical reactions or for modifying the crystal structure of substances (blasting F42D) **[3]**

4/00 **Feed devices; Feed or outlet regulating devices** (feed or outlet devices for pressure vessels B01J 3/02)

4/02 • for feeding measured quantities of reagents

4/04 • using osmotic pressure **[4]**

6/00 **Calcining; Fusing**

7/00 **Apparatus for generating gases** (production of inert gas mixtures B01J 19/14; for generating specific gases, see the relevant subclasses, e.g. C01B, C10J)

7/02 • by wet methods

8/00 **Chemical or physical processes in general, conducted in the presence of fluids and solid particles; Apparatus for such processes** (processes or devices for granulating material B01J 2/00; furnaces F27B) **[2]**

8/02 • with stationary particles, e.g. in fixed beds **[2]**

8/04 • • the fluid passing successively through two or more beds **[2]**

8/06 • • in tube reactors; the solid particles being arranged in tubes **[2]**

8/08 • with moving particles (with fluidised particles B01J 8/18) **[2]**

8/10 • • moved by stirrers or by rotary drums or rotary receptacles **[2]**

8/12 • • moved by gravity in a downward flow **[2]**

8/14 • • moving in free vortex flow apparatus (free vortex flow apparatus in general B04C) **[2]**

8/16 • with particles being subjected to vibrations or pulsations (B01J 8/40 takes precedence) **[2]**

8/18 • with fluidised particles **[2]**

8/20 • • with liquid as a fluidising medium **[2]**

8/22 • • • gas being introduced into the liquid **[2]**

8/24 • • according to "fluidised-bed" technique (B01J 8/20 takes precedence; combustion apparatus in which combustion takes place in a fluidised bed of fuel or other particles F23C 10/00) **[2]**

8/26 • • • with two or more fluidised beds, e.g. reactor and regeneration installations **[2]**

8/28 • • • • the one above the other **[2]**

8/30 • • • • • the edge of a lower bed projecting beyond the edge of the superjacent bed **[2]**

8/32 • • • with introduction into the fluidised bed of more than one kind of moving particles **[2]**

8/34 • • • with stationary packing material in the fluidised bed, e.g. bricks, wire rings, baffles **[2]**

8/36 • • • with fluidised bed through which there is an essentially horizontal flow of particles **[2]**

8/38 • • • with fluidised bed containing a rotatable device or being subject to rotation **[2]**

8/40 • • • with fluidised bed subjected to vibrations or pulsations **[2]**

8/42 • • • with fluidised bed subjected to electric current or to radiations **[2]**

8/44 • • • Fluidisation grids **[2]**

8/46 • • • for treatment of endless filamentary, band or sheet material **[2]**

10/00 **Chemical processes in general for reacting liquid with gaseous media other than in the presence of solid particles, or apparatus specially adapted therefor** (B01J 19/08 takes precedence; separation, e.g. distillation, also combined with chemical reactions B01D) **[3]**

10/02 • of the thin-film type **[3]**

12/00 **Chemical processes in general for reacting gaseous media with gaseous media; Apparatus specially adapted therefor** (B01J 3/08, B01J 8/00, B01J 19/08 take precedence) **[3]**

12/02 • for obtaining at least one reaction product which, at normal temperature, is in the solid state **[3]**

13/00 **Colloid chemistry, e.g. the production of colloidal materials or their solutions, not otherwise provided for; Making microcapsules or microballoons** (use of substances as emulsifying, wetting, dispersing or foam producing agents B01F 17/00)

13/02 • Making microcapsules or microballoons

13/04 • • by physical processes, e.g. drying, spraying **[5]**

13/06 • • by phase separation **[5]**

13/08 • • • Simple coacervation, i.e. addition of highly hydrophilic material **[5]**

13/10 • • • Complex coacervation, i.e. interaction of oppositely charged particles **[5]**

13/12 • • • removing solvent from the wall-forming material solution **[5]**

13/14 • • • Polymerisation, crosslinking **[5]**

13/16 • • • • Interfacial polymerisation **[5]**

13/18 • • • • In situ polymerisation with all reactants being present in the same phase **[5]**

13/20 • • After-treatment of capsule walls, e.g. hardening **[5]**

13/22 • • • Coating **[5]**

14/00 **Chemical processes in general for reacting liquids with liquids; Apparatus specially adapted therefor** (B01J 8/00, B01J 19/08 take precedence) **[3]**

15/00 **Chemical processes in general for reacting gaseous media with non-particulate solids, e.g. sheet material; Apparatus specially adapted therefor** (B01J 19/08 takes precedence) **[3]**

16/00 **Chemical processes in general for reacting liquids with non-particulate solids, e.g. sheet material; Apparatus specially adapted therefor** (B01J 19/08 takes precedence) **[3]**

19/00 **Chemical, physical, or physico-chemical processes in general** (physical treatment of fibres, threads, yarns, fabrics, feathers or fibrous goods made from such materials, see the relevant places for such treatment, e.g. D06M 10/00)**; Their relevant apparatus** (packings, fillings or grids specially adapted for biological treatment of water, waste water or sewage C02F 3/10; splashing boards or grids specially adapted for trickle coolers F28F 25/08) **[3]**

19/02 • Apparatus characterised by being constructed of material selected for its chemically-resistant properties (refractory details of furnaces F27D) **[3]**

19/06 • Solidifying liquids (making micro-capsules B01J 13/02) **[3]**

19/08 • Processes employing the direct application of electric or wave energy, or particle radiation; Apparatus therefor (application of shock waves B01J 3/08; generating or handling plasma H05H 1/00) **[3]**

19/10 • • employing sonic or ultrasonic vibrations (for auxiliary pretreatment of gases or vapours to be cleaned B01D 51/08; for cleaning B08B 3/12) **[3]**

19/12 • • employing electromagnetic waves **[3]**

19/14 • Production of inert gas mixtures; Use of inert gases in general (apparatus for generating gases B01J 7/00; separation of gases or vapours B01D 53/00) **[3]**

19/16 • Preventing evaporation or oxidation of non-metallic liquids by applying a floating layer, e.g. of micro-balloons **[3]**

19/18 • Stationary reactors having moving elements inside (B01J 19/08, B01J 19/26 take precedence) **[3]**

19/20 • • in the form of helices, e.g. screw reactors (thin-film reactors B01J 10/02) **[3]**

19/22 • • in the form of endless belts **[3]**

19/24 • Stationary reactors without moving elements inside (B01J 19/08, B01J 19/26 take precedence; with stationary particles B01J 8/02) **[3]**

19/26 • Nozzle-type reactors, i.e. the distribution of the initial reactants within the reactor is effected by their introduction or injection through nozzles **[3]**

19/28 • Moving reactors, e.g. rotary drums (B01J 19/08 takes precedence; centrifuges B04B; rotary drum furnaces F27B 7/00) **[3]**

19/30 • Loose or shaped packing elements, e.g. Raschig rings or Berl saddles, for pouring into the apparatus for mass or heat transfer **[5]**

19/32 • Packing elements in the form of grids or built-up elements for forming a unit or module inside the apparatus for mass or heat transfer **[5]**

Solid sorbent compositions; Filter aid compositions; Sorbents for chromatography; Catalysts [3]

Note(s)

1. In groups B01J 20/00-B01J 31/00, metal salts having an anion composed of metal and oxygen only, e.g. molybdates, are considered as chemically bound mixtures of the component metal oxides.
2. Attention is drawn to the definitions of groups of chemical elements following the title of section C.
3. In group B01J 20/00 and in each set of groups B01J 21/00-B01J 31/00 and B01J 32/00-B01J 38/00, in the absence of an indication to the contrary, classification is made in the last appropriate place.
4. Pure compounds or elements, or their recovery from solid sorbent compositions, filter aid compositions, or catalysts, are classified in the appropriate subclass for chemical compounds or elements. However, when it is explicitly stated that the pure compound or element, in a particular form, is especially useful as a solid sorbent, filter aid, or catalyst, it is further classified in group B01J 20/00 or B01J 35/00.

20/00 **Solid sorbent compositions or filter aid compositions; Sorbents for chromatography; Processes for preparing, regenerating or reactivating thereof** (use of solid sorbent compositions in liquid separation B01D 15/00; use of filter aid compositions B01D 37/02; use of sorbent compositions in gas separation B01D 53/02, B01D 53/14) **[3, 2006.01]**

20/02 • comprising inorganic material **[3]**

20/04 • • comprising compounds of alkali metals, alkaline earth metals or magnesium **[3]**

20/06 • • comprising oxides or hydroxides of metals not provided for in group B01J 20/04 **[3]**

20/08 • • • comprising aluminium oxide or hydroxide; comprising bauxite **[3]**

20/10 • • comprising silica or silicate **[3]**

20/12 • • • Naturally occurring clays or bleaching earth **[3]**

20/14 • • • Diatomaceous earth **[3]**

20/16 • • • Alumino-silicates (B01J 20/12 takes precedence) **[3]**

20/18 • • • • Synthetic zeolitic molecular sieves **[3]**

20/20 • • comprising free carbon; comprising carbon obtained by carbonising processes (active carbon C01B 31/08) **[3]**

20/22 • comprising organic material **[3]**

20/24 • • Naturally occurring macromolecular compounds, e.g. humic acids or their derivatives **[3]**

20/26 • • Synthetic macromolecular compounds **[3]**

20/28 • characterised by their form or physical properties **[3]**

20/281 • Sorbents specially adapted for preparative, analytical or investigative chromatography **[2006.01]**

20/282 • • Porous sorbents (ion exchange B01J 39/00-B01J 41/00) **[2006.01]**

20/283 • • • based on silica **[2006.01]**

20/284 • • • based on alumina **[2006.01]**

20/285 • • • based on polymers **[2006.01]**

20/286 • • Phases chemically bonded to a substrate, e.g. to silica or to polymers **[2006.01]**

20/287 • • • Non-polar phases; Reversed phases **[2006.01]**

20/288 • • • Polar phases **[2006.01]**

20/289 • • • bonded via a spacer **[2006.01]**

20/29 • • Chiral phases **[2006.01]**

20/291 • • Gel sorbents **[2006.01]**

20/292 • • Liquid sorbents **[2006.01]**

20/30 • Processes for preparing, regenerating or reactivating **[3]**

20/32 • • Impregnating or coating **[3]**

20/34 • • Regenerating or reactivating **[3]**

Note(s)

1. In groups B01J 21/00-B01J 38/00, the following term is used with the meaning indicated:
   - "catalyst" covers also a carrier forming part of the catalyst.
2. Classification of the:
   - carriers;
   - forms or physical properties;
   - preparation or activation;

- regeneration or reactivation

of catalysts according to more than one of main groups B01J 21/00-B01J 31/00 is made in the following general groups:

- B01J 32/00 for such carriers;
- B01J 35/00 for such forms or physical properties;
- B01J 37/00 for such preparation or activation;
- B01J 38/00 for such regeneration or reactivation.

21/00 Catalysts comprising the elements, oxides or hydroxides of magnesium, boron, aluminium, carbon, silicon, titanium, zirconium or hafnium [2]

21/02 • Boron or aluminium; Oxides or hydroxides thereof **[2]**
21/04 • • Alumina **[2]**
21/06 • Silicon, titanium, zirconium or hafnium; Oxides or hydroxides thereof **[2]**
21/08 • • Silica **[2]**
21/10 • Magnesium; Oxides or hydroxides thereof **[2]**
21/12 • Silica and alumina **[2]**
21/14 • Silica and magnesia **[2]**
21/16 • Clays or other mineral silicates **[2]**
21/18 • Carbon **[2]**
21/20 • Regeneration or reactivation **[2]**

23/00 Catalysts comprising metals or metal oxides or hydroxides, not provided for in group B01J 21/00 (B01J 21/16 takes precedence) **[2]**

23/02 • of the alkali- or alkaline earth metals or beryllium **[2]**
23/04 • • Alkali metals **[2]**
23/06 • of zinc, cadmium or mercury **[2]**
23/08 • of gallium, indium or thallium **[2]**
23/10 • of rare earths **[2]**
23/12 • of actinides **[2]**
23/14 • of germanium, tin or lead **[2]**
23/16 • of arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium **[2]**
23/18 • • Arsenic, antimony or bismuth **[2]**
23/20 • • Vanadium, niobium or tantalum **[2]**
23/22 • • • Vanadium **[2]**
23/24 • • Chromium, molybdenum or tungsten **[2]**
23/26 • • • Chromium **[2]**
23/28 • • • Molybdenum **[2]**
23/30 • • • Tungsten **[2]**
23/31 • • • combined with bismuth **[3]**
23/32 • • Manganese, technetium or rhenium **[2]**
23/34 • • • Manganese **[2]**
23/36 • • • Rhenium **[2]**
23/38 • of noble metals **[2]**
23/40 • • of the platinum group metals **[2]**
23/42 • • • Platinum **[2]**
23/44 • • • Palladium **[2]**
23/46 • • • Ruthenium, rhodium, osmium or iridium **[2]**
23/48 • • Silver or gold **[2]**
23/50 • • • Silver **[2]**
23/52 • • • Gold **[2]**
23/54 • • combined with metals, oxides or hydroxides provided for in groups B01J 23/02-B01J 23/36 **[2]**
23/56 • • • Platinum group metals **[2]**
23/58 • • • • with alkali- or alkaline earth metals or beryllium **[2, 6]**
23/60 • • • • with zinc, cadmium or mercury **[2]**
23/62 • • • • with gallium, indium, thallium, germanium, tin or lead **[2]**
23/63 • • • • with rare earths or actinides **[6]**
23/64 • • • • with arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium **[2]**
23/644 • • • • • Arsenic, antimony or bismuth **[6]**
23/648 • • • • • Vanadium, niobium or tantalum **[6]**
23/652 • • • • • Chromium, molybdenum or tungsten **[6]**
23/656 • • • • • Manganese, technetium or rhenium **[6]**
23/66 • • • Silver or gold **[2]**
23/68 • • • • with arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium **[2]**
23/70 • of the iron group metals or copper **[2]**
23/72 • • Copper **[2]**
23/74 • • Iron group metals **[2]**
23/745 • • • Iron **[6]**
23/75 • • • Cobalt **[6]**
23/755 • • • Nickel **[6]**
23/76 • • combined with metals, oxides or hydroxides provided for in groups B01J 23/02-B01J 23/36 **[2]**
23/78 • • • with alkali- or alkaline earth metals or beryllium **[2, 6]**
23/80 • • • with zinc, cadmium or mercury **[2]**
23/825 • • • with gallium, indium or thallium **[6]**
23/83 • • • with rare earths or actinides **[6]**
23/835 • • • with germanium, tin or lead **[6]**
23/84 • • • with arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium **[2]**
23/843 • • • • Arsenic, antimony or bismuth **[6]**
23/847 • • • • Vanadium, niobium or tantalum **[6]**
23/85 • • • • Chromium, molybdenum, or tungsten **[3]**
23/86 • • • • • Chromium **[2, 3]**
23/88 • • • • • Molybdenum **[2, 3]**
23/881 • • • • • • and iron **[6]**
23/882 • • • • • • and cobalt **[6]**
23/883 • • • • • • and nickel **[6]**
23/885 • • • • • • and copper **[6]**
23/887 • • • • • • containing in addition other metals, oxides or hydroxides provided for in groups B01J 23/02-B01J 23/36 **[6]**
23/888 • • • • • Tungsten **[6]**
23/889 • • • • Manganese, technetium or rhenium **[6]**
23/89 • • combined with noble metals **[3]**
23/90 • Regeneration or reactivation **[2]**
23/92 • • of catalysts comprising metals, oxides or hydroxides provided for in groups B01J 23/02-B01J 23/36 **[2]**
23/94 • • of catalysts comprising metals, oxides or hydroxides of the iron group metals or copper **[2]**
23/96 • • of catalysts comprising metals, oxides or hydroxides of the noble metals **[2]**

25/00 Catalysts of the Raney type [2]

25/02 • Raney nickel **[2]**
25/04 • Regeneration or reactivation **[2]**

27/00 Catalysts comprising the elements or compounds of halogens, sulfur, selenium, tellurium, phosphorus or nitrogen; Catalysts comprising carbon compounds [4]

Note(s)

Metal catalysts or metal oxide catalysts activated or conditioned by halogens, sulfur or phosphorus, or compounds thereof are classified in the appropriate groups for metal catalysts or metal oxide catalysts.

27/02 • Sulfur, selenium or tellurium; Compounds thereof **[4]**
27/04 • • Sulfides **[2]**
27/043 • • • with iron group metals or platinum group metals **[4]**
27/045 • • • • Platinum group metals **[4]**
27/047 • • • with chromium, molybdenum, tungsten or polonium **[4]**
27/049 • • • • with iron group metals or platinum group metals **[4]**
27/051 • • • • Molybdenum **[4]**
27/053 • • Sulfates **[4]**
27/055 • • • with alkali metals, copper, gold or silver **[4]**
27/057 • • Selenium or tellurium; Compounds thereof **[4]**
27/06 • Halogens; Compounds thereof **[4]**
27/08 • • Halides **[2]**
27/10 • • • Chlorides **[2]**
27/12 • • • Fluorides **[2]**
27/122 • • • of copper **[4]**
27/125 • • with scandium, yttrium, aluminium, gallium, indium or thallium **[4]**
27/128 • • with iron group metals or platinum group metals **[4]**
27/13 • • • Platinum group metals **[4]**
27/132 • • with chromium, molybdenum, tungsten or polonium **[4]**
27/135 • • with titanium, zirconium, hafnium, germanium, tin or lead **[4]**
27/138 • • with alkaline earth metals, magnesium, beryllium, zinc, cadmium or mercury **[4]**
27/14 • Phosphorus; Compounds thereof **[4]**
27/16 • • containing oxygen **[2]**
27/18 • • • with metals **[2]**
27/182 • • with silicon **[4]**
27/185 • • with iron group metals or platinum group metals **[4]**
27/186 • • with arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium **[5]**
27/187 • • • with manganese, technetium or rhenium **[5]**
27/188 • • • with chromium, molybdenum, tungsten or polonium **[4, 5]**
27/19 • • • • Molybdenum **[4, 5]**
27/192 • • • • • with bismuth **[4, 5]**
27/195 • • • with vanadium, niobium or tantalum **[4, 5]**
27/198 • • • • Vanadium **[4, 5]**
27/199 • • • • • with chromium, molybdenum, tungsten or polonium **[5]**
27/20 • Carbon compounds **[2]**
27/22 • • Carbides **[2]**
27/224 • • • Silicon carbide **[4]**
27/228 • • • • with phosphorus, arsenic, antimony or bismuth **[4]**
27/232 • • Carbonates **[4]**
27/236 • • • Hydroxy carbonates **[4]**
27/24 • Nitrogen compounds **[2]**
27/25 • • Nitrates **[4]**
27/26 • • Cyanides **[2]**
27/28 • Regeneration or reactivation **[2]**
27/30 • • of catalysts comprising compounds of sulfur, selenium or tellurium **[2]**
27/32 • • of catalysts comprising compounds of halogens **[2]**

29/00 Catalysts comprising molecular sieves [2]

Note(s)

In this group, the following term is used with the meaning indicated:

- "zeolites" means:
  - i. crystalline aluminosilicates with base-exchange and molecular sieve properties, having three dimensional, microporous lattice framework structure of tetrahedral oxide units;
  - ii. compounds isomorphous to those of the former category, wherein the aluminium or silicon atoms in the framework are partly or wholly replaced by atoms of other elements, e.g. by gallium, germanium, phosphorus or boron.

29/03 • not having base-exchange properties **[6]**
29/035 • • Crystalline silica polymorphs, e.g. silicalites **[6]**
29/04 • having base-exchange properties, e.g. crystalline zeolites, pillared clays **[2, 6]**
29/06 • • Crystalline aluminosilicate zeolites; Isomorphous compounds thereof **[2]**
29/064 • • • containing iron group metals, noble metals or copper **[6]**
29/068 • • • • Noble metals **[6]**
29/072 • • • • Iron group metals or copper **[6]**
29/076 • • • containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium **[6]**
29/08 • • • of the faujasite type, e.g. type X or Y **[2]**
29/10 • • • • containing iron group metals, noble metals or copper **[2]**
29/12 • • • • • Noble metals **[2]**
29/14 • • • • • Iron group metals or copper **[2]**
29/16 • • • • containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium **[2]**
29/18 • • • of the mordenite type **[2]**
29/20 • • • • containing iron group metals, noble metals or copper **[2]**
29/22 • • • • • Noble metals **[2]**
29/24 • • • • • Iron group metals or copper **[2]**
29/26 • • • • containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium **[2]**
29/40 • • • of the pentasil type, e.g. types ZSM-5, ZSM-8 or ZSM-11 **[6]**
29/42 • • • • containing iron group metals, noble metals or copper **[6]**
29/44 • • • • • Noble metals **[6]**
29/46 • • • • • Iron group metals or copper **[6]**
29/48 • • • • containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium **[6]**
29/50 • • • of the erionite or offretite type, e.g. zeolite T **[6]**

29/52 • • • • containing iron group metals, noble metals or copper **[6]**
29/54 • • • • • Noble metals **[6]**
29/56 • • • • • Iron group metals or copper **[6]**
29/58 • • • • containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium **[6]**
29/60 • • • of the type L **[6]**
29/61 • • • • containing iron group metals, noble metals or copper **[6]**
29/62 • • • • • Noble metals **[6]**
29/63 • • • • • Iron group metals or copper **[6]**
29/64 • • • • containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium **[6]**
29/65 • • • of the ferrierite type, e.g. types ZSM-21, ZSM-35 or ZSM-38 **[6]**
29/66 • • • • containing iron group metals, noble metals or copper **[6]**
29/67 • • • • • Noble metals **[6]**
29/68 • • • • • Iron group metals or copper **[6]**
29/69 • • • • containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium **[6]**
29/70 • • • of types characterised by their specific structure not provided for in groups B01J 29/08-B01J 29/65 **[6]**
29/72 • • • • containing iron group metals, noble metals or copper **[6]**
29/74 • • • • • Noble metals **[6]**
29/76 • • • • • Iron group metals or copper **[6]**
29/78 • • • • containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium **[6]**
29/80 • • • Mixtures of different zeolites **[6]**
29/82 • Phosphates **[6]**
29/83 • • Aluminophosphates (APO compounds) **[6]**
29/84 • • Aluminophosphates containing other elements, e.g. metals, boron **[6]**
29/85 • • • Silicoaluminophosphates (SAPO compounds) **[6]**
29/86 • Borosilicates; Aluminoborosilicates **[6]**
29/87 • Gallosilicates; Aluminogallosilicates; Galloborosilicates **[6]**
29/88 • Ferrosilicates; Ferroaluminosilicates **[6]**
29/89 • Silicates, aluminosilicates or borosilicates of titanium, zirconium or hafnium **[6]**
29/90 • Regeneration or reactivation **[6]**

31/00 Catalysts comprising hydrides, coordination complexes or organic compounds (catalyst compositions used only in polymerisation reactions C08) **[2]**

Note(s)

In this group, the presence of water is disregarded for classification purposes.

31/02 • containing organic compounds or metal hydrides **[2]**
31/04 • • containing carboxylic acids or their salts **[2]**
31/06 • • containing polymers **[2]**
31/08 • • • Ion-exchange resins **[2]**
31/10 • • • • sulfonated **[2]**
31/12 • • containing organo-metallic compounds or metal hydrides **[2]**
31/14 • • • of aluminium or boron **[2]**
31/16 • containing coordination complexes **[2]**
31/18 • • containing nitrogen, phosphorus, arsenic or antimony **[2]**
31/20 • • Carbonyls **[2]**
31/22 • • Organic complexes **[2]**
31/24 • • Phosphines **[2]**
31/26 • containing in addition, inorganic metal compounds not provided for in groups B01J 31/02-B01J 31/24 **[2]**
31/28 • • of the platinum group metals, iron group metals or copper **[2]**
31/30 • • • Halides **[2]**
31/32 • • of manganese, technetium or rhenium **[2]**
31/34 • • of chromium, molybdenum or tungsten **[2]**
31/36 • • of vanadium, niobium or tantalum **[2]**
31/38 • • of titanium, zirconium or hafnium **[2]**
31/40 • Regeneration or reactivation **[2]**

Note(s)

1. When classifying in groups B01J 32/00-B01J 38/00, any part of a catalyst that is not identified by this classification, and which itself is determined to be novel and non-obvious, must also be classified in groups B01J 21/00-B01J 31/00. Such a part of a catalyst can be either a single substance or a composition in itself.
2. Any part of a catalyst which is not identified by the classification according to Note (1) above, and which is considered to represent information of interest for search, may also be classified. This can, for example, be the case when it is considered of interest to enable searching of catalysts using a combination of classification symbols. Such non-obligatory classification should be given as "additional information".

32/00 Catalyst carriers in general [4]

33/00 Protection of catalysts, e.g. by coating [2]

35/00 Catalysts, in general, characterised by their form or physical properties [2]

35/02 • Solids **[2]**
35/04 • • Foraminous structures, sieves, grids, honeycombs **[2]**
35/06 • • Fabrics or filaments **[2]**
35/08 • • Spheres **[2]**
35/10 • • characterised by their surface properties or porosity **[2]**
35/12 • Liquids or melts **[2]**

37/00 Processes, in general, for preparing catalysts; Processes, in general, for activation of catalysts [4]

37/02 • Impregnation, coating or precipitation (protecting by coating B01J 33/00) **[2]**
37/025 • • using a distinct intermediate layer, e.g. substrate-support-active layer **[6]**
37/03 • • Precipitation; Co-precipitation **[4]**
37/04 • Mixing **[2]**
37/06 • Washing **[2]**
37/08 • Heat treatment **[2]**
37/10 • • in the presence of water, e.g. steam **[2]**
37/12 • Oxidising **[2]**
37/14 • • with gases containing free oxygen **[2]**

37/16 • Reducing **[2]**
37/18 • • with gases containing free hydrogen **[2]**
37/20 • Sulfiding **[2]**
37/22 • Halogenating **[2]**
37/24 • • Chlorinating **[2]**
37/26 • • Fluorinating **[2]**
37/28 • Phosphorising **[2]**
37/30 • Ion-exchange **[2]**
37/32 • Freeze drying, i.e. lyophilisation **[2]**
37/34 • Irradiation by, or application of, electric, magnetic or wave energy, e.g. ultrasonic waves **[2]**
37/36 • Biochemical methods **[2]**

38/00 Regeneration or reactivation of catalysts, in general [4]
38/02 • Heat treatment **[4]**
38/04 • Gas or vapour treating; Treating by using liquids vaporisable upon contacting spent catalyst **[4]**
38/06 • • using steam **[4]**
38/08 • • using ammonia or derivatives thereof **[4]**
38/10 • • using elemental hydrogen **[4]**
38/12 • • Treating with free oxygen-containing gas **[4]**
38/14 • • • with control of oxygen content in oxidation gas **[4]**
38/16 • • • Oxidation gas comprising essentially steam and oxygen **[4]**
38/18 • • • with subsequent reactive gas treating **[4]**
38/20 • • • Plural distinct oxidation stages **[4]**
38/22 • • • Moving bed, e.g. vertically or horizontally moving bulk **[4]**
38/24 • • • • having mainly transverse, i.e. lateral, flow of oxygen-containing gas and material **[4]**
38/26 • • • • having mainly counter-current flow of oxygen-containing gas and material **[4]**
38/28 • • • • having mainly concurrent flow of oxygen-containing gas and material **[4]**
38/30 • • • in gaseous suspension, e.g. fluidised bed **[4]**
38/32 • • • • Indirectly heating or cooling material within regeneration zone or prior to entry into regeneration zone **[4]**
38/34 • • • • with plural distinct serial combustion stages **[4]**
38/36 • • • • and with substantially complete oxidation of carbon monoxide to carbon dioxide within regeneration zone **[4]**
38/38 • • • and adding heat by solid heat carrier **[4]**
38/40 • • • and forming useful by-products **[4]**
38/42 • • using halogen-containing material **[4]**
38/44 • • • and adding simultaneously or subsequently free oxygen; using oxyhalogen compound **[4]**
38/46 • • • fluorine-containing **[4]**
38/48 • Liquid treating or treating in liquid phase, e.g. dissolved or suspended **[4]**
38/50 • • using organic liquids **[4]**
38/52 • • • oxygen-containing **[4]**
38/54 • • • halogen-containing **[4]**
38/56 • • • Hydrocarbons **[4]**
38/58 • • • and gas addition thereto **[4]**
38/60 • • using acids **[4]**
38/62 • • • organic **[4]**
38/64 • • using alkaline material; using salts **[4]**
38/66 • • • using ammonia or derivatives thereof **[4]**
38/68 • • including substantial dissolution or chemical precipitation of a catalyst component in the ultimate reconstitution of the catalyst **[4]**
38/70 • • Wet oxidation of material submerged in liquid **[4]**
38/72 • including segregation of diverse particles **[4]**
38/74 • utilising ion-exchange **[4]**

Ion-exchange [3]

Note(s)

1. In groups B01J 39/00-B01J 49/00:
   - ion-exchange covers all processes whereby ions are exchanged between the solid exchanger and the liquid to be treated and wherein the exchanger is not soluble in the liquid to be treated;
   - ion-exchange processes cover also ion-exchange in combination with complex or chelate forming reactions.
2. In groups B01J 39/00-B01J 49/00, in the absence of an indication to the contrary, classification is made in the last appropriate place.

39/00 Cation exchange; Use of material as cation exchangers; Treatment of material for improving the cation exchange properties (ion-exchange chromatography processes B01D 15/36) **[3, 2006.01]**
39/02 • Processes using inorganic exchangers **[3]**
39/04 • Processes using organic exchangers **[3]**
39/08 • Use of material as cation exchangers; Treatment of material for improving the cation exchange properties **[3]**
39/10 • • Oxides or hydroxides **[3]**
39/12 • • Compounds containing phosphorus **[3]**
39/14 • • Base exchange silicates, e.g. zeolites **[3]**
39/16 • • Organic material **[3]**
39/18 • • • Macromolecular compounds **[3]**
39/20 • • • • Macromolecular compounds obtained by reactions only involving unsaturated carbon-to-carbon bonds **[3]**
39/22 • • • • Cellulose or wood; Derivatives thereof **[3]**
39/24 • • Carbon, coal or tar **[3]**
39/26 • Cation exchangers for chromatographic processes **[2006.01]**

41/00 Anion exchange; Use of material as anion exchangers; Treatment of material for improving the anion exchange properties (ion-exchange chromatography processes B01D 15/36) **[3, 2006.01]**
41/02 • Processes using inorganic exchangers **[3]**
41/04 • Processes using organic exchangers **[3]**
41/08 • Use of material as anion exchangers; Treatment of material for improving the anion exchange properties **[3]**
41/10 • • Inorganic material (carbon, coal or tar B01J 41/18) **[3]**
41/12 • • Macromolecular compounds **[3]**
41/14 • • • Macromolecular compounds obtained by reactions only involving unsaturated carbon-to-carbon bonds **[3]**
41/16 • • • Cellulose or wood; Derivatives thereof **[3]**
41/18 • • Carbon, coal or tar **[3]**
41/20 • Anion exchangers for chromatographic processes **[2006.01]**

43/00 **Amphoteric ion-exchange, i.e. using ion-exchangers having cationic and anionic groups; Use of material as amphoteric ion-exchangers; Treatment of material for improving their amphoteric ion-exchange properties** (ion-exchange chromatography processes B01D 15/36) **[3, 2006.01]**

45/00 **Ion-exchange in which a complex or a chelate is formed; Use of material as complex or chelate forming ion-exchangers; Treatment of material for improving the complex or chelate forming ion-exchange properties** (ion-exchange chromatography processes B01D 15/36) **[3, 2006.01]**

47/00 **Ion-exchange processes in general; Apparatus therefor** (ion-exchange chromatography processes or apparatus B01D 15/08) **[3, 2006.01]**

47/02 • Column or bed processes **[3]**

47/04 • • Mixed-bed processes **[3]**

47/06 • • during which the ion-exchange material is subjected to a physical treatment, e.g. heat, electric current, irradiation, vibration (electrodialysis, electro-osmosis B01D 61/42) **[3]**

47/08 • • • subjected to a direct electric current **[3]**

47/10 • with moving ion-exchange material; with ion-exchange material in suspension or in fluidised-bed form **[3]**

47/12 • characterised by the use of ion-exchange material in the form of sheets, ribbons or filaments, e.g. membranes (electrodialysis, electro-osmosis B01D 61/42) **[3]**

47/14 • Controlling or regulating **[3]**

49/00 **Regeneration or reactivation of ion-exchangers; Apparatus therefor** (ion-exchange chromatography processes or apparatus B01D 15/08) **[3, 2006.01]**

49/02 • having devices which prevent back-flow of the ion-exchange mass during regenerating **[3]**