

SECTION B — PERFORMING OPERATIONS; TRANSPORTING

B01 PHYSICAL OR CHEMICAL PROCESSES OR APPARATUS IN GENERAL

B01J CHEMICAL OR PHYSICAL PROCESSES, e.g. CATALYSIS OR COLLOID CHEMISTRY; THEIR RELEVANT APPARATUS [2]

Note(s) [2, 3, 6]

- 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.
- 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
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GRANULATION.....	2/00

- 2/00 Processes or devices for granulating materials, in general; Rendering particulate materials free flowing in general, e.g. making them hydrophobic [1, 4, 2006.01]**
- 2/02 • by dividing the liquid material into drops, e.g. by spraying, and solidifying the drops [1, 2006.01]
- 2/04 • • in a gaseous medium [1, 2006.01]
- 2/06 • • in a liquid medium [1, 2006.01]
- 2/08 • • • Gelation of a colloidal solution [1, 2006.01]
- 2/10 • in stationary drums or troughs, provided with kneading or mixing appliances [1, 2006.01]
- 2/12 • in rotating drums [1, 2006.01]
- 2/14 • in rotating dishes or pans [1, 2006.01]
- 2/16 • by suspending the powder material in a gas, e.g. in fluidised beds or as a falling curtain [1, 2006.01]
- 2/18 • using a vibrating apparatus [1, 2006.01]
- 2/20 • by expressing the material, e.g. through sieves and fragmenting the extruded length [1, 2006.01]
- 2/22 • by pressing in moulds or between rollers [1, 2006.01]

- 2/24 • Obtaining flakes by scraping a solid layer from a surface [1, 2006.01]
- 2/26 • on endless conveyor belts [1, 2006.01]
- 2/28 • using special binding agents [1, 2006.01]
- 2/30 • using agents to prevent the granules sticking together; Rendering particulate materials free flowing in general, e.g. making them hydrophobic [1, 4, 2006.01]
- 3/00 Processes of utilising sub-atmospheric or super-atmospheric pressure to effect chemical or physical change of matter; Apparatus therefor** (pressure vessels for containing or storing compressed, liquefied or solidified gases F17C) [1, 2, 2006.01]
- 3/02 • Feed or outlet devices therefor [1, 2006.01]
- 3/03 • Pressure vessels, or vacuum vessels, having closure members or seals specially adapted therefor [3, 2006.01]
- 3/04 • Pressure vessels, e.g. autoclaves [2, 2006.01]

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- 3/06 • Processes using ultra-high pressure, e.g. for the formation of diamonds; Apparatus therefor, e.g. moulds or dies (B01J 3/04 takes precedence) [2, 2006.01]
- 3/08 • • Application of shock waves for chemical reactions or for modifying the crystal structure of substances [3, 2006.01]
- 4/00 **Feed devices; Feed or outlet control devices** (feed or outlet devices for pressure vessels B01J 3/02) [1, 2006.01]
- 4/02 • for feeding measured quantities of reagents [1, 2006.01]
- 4/04 • using osmotic pressure [4, 2006.01]
- 6/00 **Calcining; Fusing** [1, 2006.01]
- 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) [1, 2006.01]
- 7/02 • by wet methods [1, 2006.01]
- 8/00 **Chemical or physical processes in general, conducted in the presence of fluids and solid particles; Apparatus for such processes** [2, 2006.01]
- 8/02 • with stationary particles, e.g. in fixed beds [2, 2006.01]
- 8/04 • • the fluid passing successively through two or more beds [2, 2006.01]
- 8/06 • • in tube reactors; the solid particles being arranged in tubes [2, 2006.01]
- 8/08 • with moving particles (with fluidised particles B01J 8/18) [2, 2006.01]
- 8/10 • • moved by stirrers or by rotary drums or rotary receptacles [2, 2006.01]
- 8/12 • • moved by gravity in a downward flow [2, 2006.01]
- 8/14 • • moving in free vortex flow apparatus [2, 2006.01]
- 8/16 • with particles being subjected to vibrations or pulsations (B01J 8/40 takes precedence) [2, 2006.01]
- 8/18 • with fluidised particles [2, 2006.01]
- 8/20 • • with liquid as a fluidising medium [2, 2006.01]
- 8/22 • • • gas being introduced into the liquid [2, 2006.01]
- 8/24 • • according to "fluidised-bed" technique (B01J 8/20 takes precedence) [2, 2006.01]
- 8/26 • • • with two or more fluidised beds, e.g. reactor and regeneration installations [2, 2006.01]
- 8/28 • • • • the one above the other [2, 2006.01]
- 8/30 • • • • the edge of a lower bed projecting beyond the edge of the superjacent bed [2, 2006.01]
- 8/32 • • • with introduction into the fluidised bed of more than one kind of moving particles [2, 2006.01]
- 8/34 • • • with stationary packing material in the fluidised bed, e.g. bricks, wire rings, baffles [2, 2006.01]
- 8/36 • • • with fluidised bed through which there is an essentially horizontal flow of particles [2, 2006.01]
- 8/38 • • • with fluidised bed containing a rotatable device or being subject to rotation [2, 2006.01]
- 8/40 • • • with fluidised bed subjected to vibrations or pulsations [2, 2006.01]
- 8/42 • • • with fluidised bed subjected to electric current or to radiations [2, 2006.01]
- 8/44 • • • Fluidisation grids [2, 2006.01]
- 8/46 • • • for treatment of endless filamentary, band or sheet material [2, 2006.01]
- 10/00 **Chemical processes in general for reacting liquid with gaseous media other than in the presence of solid particles; Apparatus specially adapted therefor** (B01J 19/08 takes precedence; separation, e.g. distillation, also combined with chemical reactions B01D) [3, 2006.01]
- 10/02 • of the thin-film type [3, 2006.01]
- 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, 2006.01]
- 12/02 • for obtaining at least one reaction product which, at normal temperature, is in the solid state [3, 2006.01]
- 13/00 **Colloid chemistry, e.g. the production of colloidal materials or their solutions, not otherwise provided for; Making microcapsules or microballoons** [1, 2006.01]
- 13/02 • Making microcapsules or microballoons [1, 2006.01]
- 13/04 • • by physical processes, e.g. drying, spraying [5, 2006.01]
- 13/06 • • by phase separation [5, 2006.01]
- 13/08 • • • Simple coacervation, i.e. addition of highly hydrophilic material [5, 2006.01]
- 13/10 • • • Complex coacervation, i.e. interaction of oppositely charged particles [5, 2006.01]
- 13/12 • • • removing solvent from the wall-forming material solution [5, 2006.01]
- 13/14 • • • Polymerisation, crosslinking [5, 2006.01]
- 13/16 • • • • Interfacial polymerisation [5, 2006.01]
- 13/18 • • • • In situ polymerisation with all reactants being present in the same phase [5, 2006.01]
- 13/20 • • After-treatment of capsule walls, e.g. hardening [5, 2006.01]
- 13/22 • • • Coating [5, 2006.01]
- 14/00 **Chemical processes in general for reacting liquids with liquids; Apparatus specially adapted therefor** (B01J 8/00, B01J 19/08 take precedence) [3, 2006.01]
- 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, 2006.01]
- 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, 2006.01]
- 19/00 **Chemical, physical or physico-chemical processes in general; Their relevant apparatus** [3, 2006.01]
- 19/02 • Apparatus characterised by being constructed of material selected for its chemically-resistant properties [3, 2006.01]
- 19/06 • Solidifying liquids (making microcapsules B01J 13/02) [3, 2006.01]
- 19/08 • Processes employing the direct application of electric or wave energy, or particle radiation; Apparatus therefor (application of shock waves B01J 3/08) [3, 2006.01]
- 19/10 • • employing sonic or ultrasonic vibrations [3, 2006.01]
- 19/12 • • employing electromagnetic waves [3, 2006.01]

- 19/14 • Production of inert gas mixtures; Use of inert gases in general [3, 2006.01]
- 19/16 • Preventing evaporation or oxidation of non-metallic liquids by applying a floating layer, e.g. of microballoons [3, 2006.01]
- 19/18 • Stationary reactors having moving elements inside (B01J 19/08, B01J 19/26 take precedence) [3, 2006.01]
- 19/20 • • in the form of helices, e.g. screw reactors [3, 2006.01]
- 19/22 • • in the form of endless belts [3, 2006.01]
- 19/24 • Stationary reactors without moving elements inside (B01J 19/08, B01J 19/26 take precedence; with stationary particles B01J 8/02) [3, 2006.01]
- 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, 2006.01]
- 19/28 • Moving reactors, e.g. rotary drums (B01J 19/08 takes precedence) [3, 2006.01]
- 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, 2006.01]
- 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, 2006.01]
- 20/16 • • • Alumino-silicates (B01J 20/12 takes precedence) [3, 2006.01]
- 20/18 • • • • Synthetic zeolitic molecular sieves [3, 2006.01]
- 20/20 • • comprising free carbon; comprising carbon obtained by carbonising processes [3, 2006.01]
- 20/22 • • comprising organic material [3, 2006.01]
- 20/24 • • Naturally occurring macromolecular compounds, e.g. humic acids or their derivatives [3, 2006.01]
- 20/26 • • Synthetic macromolecular compounds [3, 2006.01]
- 20/28 • characterised by their form or physical properties [3, 2006.01]
- 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, 2006.01]
- 20/32 • • Impregnating or coating [3, 2006.01]
- 20/34 • • Regenerating or reactivating [3, 2006.01]

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

Note(s) [2, 5]

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 groups B01J 20/00-B01J 31/00, the last place priority rule is applied, i.e. at each hierarchical level, 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 [3, 2006.01]

- 20/02 • comprising inorganic material [3, 2006.01]
- 20/04 • • comprising compounds of alkali metals, alkaline earth metals or magnesium [3, 2006.01]
- 20/06 • • comprising oxides or hydroxides of metals not provided for in group B01J 20/04 [3, 2006.01]
- 20/08 • • • comprising aluminium oxide or hydroxide; comprising bauxite [3, 2006.01]
- 20/10 • • comprising silica or silicate [3, 2006.01]
- 20/12 • • • Naturally occurring clays or bleaching earth [3, 2006.01]
- 20/14 • • • Diatomaceous earth [3, 2006.01]

Note(s) [2, 4, 5]

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, 2006.01]

- 21/02 • Boron or aluminium; Oxides or hydroxides thereof [2, 2006.01]
- 21/04 • • Alumina [2, 2006.01]
- 21/06 • Silicon, titanium, zirconium or hafnium; Oxides or hydroxides thereof [2, 2006.01]
- 21/08 • • Silica [2, 2006.01]
- 21/10 • Magnesium; Oxides or hydroxides thereof [2, 2006.01]
- 21/12 • Silica and alumina [2, 2006.01]

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- 21/14 • Silica and magnesia [2, 2006.01]
- 21/16 • Clays or other mineral silicates [2, 2006.01]
- 21/18 • Carbon [2, 2006.01]
- 21/20 • Regeneration or reactivation [2, 2006.01]
- 23/00 Catalysts comprising metals or metal oxides or hydroxides, not provided for in group B01J 21/00 (B01J 21/16 takes precedence) [2, 2006.01]**
- 23/02 • of the alkali- or alkaline earth metals or beryllium [2, 2006.01]
- 23/04 • • Alkali metals [2, 2006.01]
- 23/06 • of zinc, cadmium or mercury [2, 2006.01]
- 23/08 • of gallium, indium or thallium [2, 2006.01]
- 23/10 • of rare earths [2, 2006.01]
- 23/12 • of actinides [2, 2006.01]
- 23/14 • of germanium, tin or lead [2, 2006.01]
- 23/16 • of arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium [2, 2006.01]
- 23/18 • • Arsenic, antimony or bismuth [2, 2006.01]
- 23/20 • • Vanadium, niobium or tantalum [2, 2006.01]
- 23/22 • • • Vanadium [2, 2006.01]
- 23/24 • • Chromium, molybdenum or tungsten [2, 2006.01]
- 23/26 • • • Chromium [2, 2006.01]
- 23/28 • • • Molybdenum [2, 2006.01]
- 23/30 • • • Tungsten [2, 2006.01]
- 23/31 • • • combined with bismuth [3, 2006.01]
- 23/32 • • Manganese, technetium or rhenium [2, 2006.01]
- 23/34 • • • Manganese [2, 2006.01]
- 23/36 • • • Rhenium [2, 2006.01]
- 23/38 • of noble metals [2, 2006.01]
- 23/40 • • of the platinum group metals [2, 2006.01]
- 23/42 • • • Platinum [2, 2006.01]
- 23/44 • • • Palladium [2, 2006.01]
- 23/46 • • • Ruthenium, rhodium, osmium or iridium [2, 2006.01]
- 23/48 • • Silver or gold [2, 2006.01]
- 23/50 • • • Silver [2, 2006.01]
- 23/52 • • • Gold [2, 2006.01]
- 23/54 • • combined with metals, oxides or hydroxides provided for in groups B01J 23/02-B01J 23/36 [2, 2006.01]
- 23/56 • • • Platinum group metals [2, 2006.01]
- 23/58 • • • • with alkali- or alkaline earth metals or beryllium [2, 6, 2006.01]
- 23/60 • • • • with zinc, cadmium or mercury [2, 2006.01]
- 23/62 • • • • with gallium, indium, thallium, germanium, tin or lead [2, 2006.01]
- 23/63 • • • • with rare earths or actinides [6, 2006.01]
- 23/64 • • • • with arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium [2, 2006.01]
- 23/644 • • • • • Arsenic, antimony or bismuth [6, 2006.01]
- 23/648 • • • • • Vanadium, niobium or tantalum [6, 2006.01]
- 23/652 • • • • • Chromium, molybdenum or tungsten [6, 2006.01]
- 23/656 • • • • • Manganese, technetium or rhenium [6, 2006.01]
- 23/66 • • • Silver or gold [2, 2006.01]
- 23/68 • • • • with arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium [2, 2006.01]
- 23/70 • of the iron group metals or copper [2, 2006.01]
- 23/72 • • Copper [2, 2006.01]
- 23/74 • • Iron group metals [2, 2006.01]
- 23/745 • • • Iron [6, 2006.01]
- 23/75 • • • Cobalt [6, 2006.01]
- 23/755 • • • Nickel [6, 2006.01]
- 23/76 • • combined with metals, oxides or hydroxides provided for in groups B01J 23/02-B01J 23/36 [2, 2006.01]
- 23/78 • • • with alkali- or alkaline earth metals or beryllium [2, 6, 2006.01]
- 23/80 • • • with zinc, cadmium or mercury [2, 2006.01]
- 23/825 • • • with gallium, indium or thallium [6, 2006.01]
- 23/83 • • • with rare earths or actinides [6, 2006.01]
- 23/835 • • • with germanium, tin or lead [6, 2006.01]
- 23/84 • • • with arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium [2, 2006.01]
- 23/843 • • • • Arsenic, antimony or bismuth [6, 2006.01]
- 23/847 • • • • Vanadium, niobium or tantalum [6, 2006.01]
- 23/85 • • • • Chromium, molybdenum, or tungsten [3, 2006.01]
- 23/86 • • • • Chromium [2, 3, 2006.01]
- 23/88 • • • • Molybdenum [2, 3, 2006.01]
- 23/881 • • • • • and iron [6, 2006.01]
- 23/882 • • • • • and cobalt [6, 2006.01]
- 23/883 • • • • • and nickel [6, 2006.01]
- 23/885 • • • • • and copper [6, 2006.01]
- 23/887 • • • • • containing in addition other metals, oxides or hydroxides provided for in groups B01J 23/02-B01J 23/36 [6, 2006.01]
- 23/888 • • • • • Tungsten [6, 2006.01]
- 23/889 • • • • Manganese, technetium or rhenium [6, 2006.01]
- 23/89 • • combined with noble metals [3, 2006.01]
- 23/90 • Regeneration or reactivation [2, 2006.01]
- 23/92 • • of catalysts comprising metals, oxides or hydroxides provided for in groups B01J 23/02-B01J 23/36 [2, 2006.01]
- 23/94 • • of catalysts comprising metals, oxides or hydroxides of the iron group metals or copper [2, 2006.01]
- 23/96 • • of catalysts comprising metals, oxides or hydroxides of the noble metals [2, 2006.01]
- 25/00 Catalysts of the Raney type [2, 2006.01]**
- 25/02 • Raney nickel [2, 2006.01]
- 25/04 • Regeneration or reactivation [2, 2006.01]
- 27/00 Catalysts comprising the elements or compounds of halogens, sulfur, selenium, tellurium, phosphorus or nitrogen; Catalysts comprising carbon compounds [4, 2006.01]**
- Note(s) [2, 5]**
- 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, 2006.01]

27/04	• • Sulfides [2, 2006.01]	27/32	• • of catalysts comprising compounds of halogens [2, 2006.01]
27/043	• • • with iron group metals or platinum group metals [4, 2006.01]	29/00	Catalysts comprising molecular sieves [2, 2006.01]
27/045	• • • • Platinum group metals [4, 2006.01]		Note(s) [6]
27/047	• • • with chromium, molybdenum, tungsten or polonium [4, 2006.01]		In this group, the following term is used with the meaning indicated:
27/049	• • • • with iron group metals or platinum group metals [4, 2006.01]		• "zeolites" means:
27/051	• • • • Molybdenum [4, 2006.01]		i. crystalline aluminosilicates with base-exchange and molecular sieve properties, having three dimensional, microporous lattice framework structure of tetrahedral oxide units; 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.
27/053	• • Sulfates [4, 2006.01]	29/03	• not having base-exchange properties [6, 2006.01]
27/055	• • • with alkali metals, copper, gold or silver [4, 2006.01]	29/035	• • Crystalline silica polymorphs, e.g. silicalites [6, 2006.01]
27/057	• • Selenium or tellurium; Compounds thereof [4, 2006.01]	29/04	• having base-exchange properties, e.g. crystalline zeolites, pillared clays [2, 6, 2006.01]
27/06	• Halogens; Compounds thereof [4, 2006.01]	29/06	• • Crystalline aluminosilicate zeolites; Isomorphous compounds thereof [2, 2006.01]
27/08	• • Halides [2, 2006.01]	29/064	• • • containing iron group metals, noble metals or copper [6, 2006.01]
27/10	• • • Chlorides [2, 2006.01]	29/068	• • • • Noble metals [6, 2006.01]
27/12	• • • Fluorides [2, 2006.01]	29/072	• • • • Iron group metals or copper [6, 2006.01]
27/122	• • • of copper [4, 2006.01]	29/076	• • • containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium [6, 2006.01]
27/125	• • with scandium, yttrium, aluminium, gallium, indium or thallium [4, 2006.01]	29/08	• • • of the faujasite type, e.g. type X or Y [2, 2006.01]
27/128	• • with iron group metals or platinum group metals [4, 2006.01]	29/10	• • • • containing iron group metals, noble metals or copper [2, 2006.01]
27/13	• • • Platinum group metals [4, 2006.01]	29/12	• • • • • Noble metals [2, 2006.01]
27/132	• • with chromium, molybdenum, tungsten or polonium [4, 2006.01]	29/14	• • • • • Iron group metals or copper [2, 2006.01]
27/135	• • with titanium, zirconium, hafnium, germanium, tin or lead [4, 2006.01]	29/16	• • • • containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium [2, 2006.01]
27/138	• • with alkaline earth metals, magnesium, beryllium, zinc, cadmium or mercury [4, 2006.01]	29/18	• • • of the mordenite type [2, 2006.01]
27/14	• Phosphorus; Compounds thereof [4, 2006.01]	29/20	• • • • containing iron group metals, noble metals or copper [2, 2006.01]
27/16	• • containing oxygen [2, 2006.01]	29/22	• • • • • Noble metals [2, 2006.01]
27/18	• • • with metals [2, 2006.01]	29/24	• • • • • Iron group metals or copper [2, 2006.01]
27/182	• • with silicon [4, 2006.01]	29/26	• • • • containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium [2, 2006.01]
27/185	• • with iron group metals or platinum group metals [4, 2006.01]	29/40	• • • of the pentasil type, e.g. types ZSM-5, ZSM-8 or ZSM-11 [6, 2006.01]
27/186	• • with arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium [5, 2006.01]	29/42	• • • • containing iron group metals, noble metals or copper [6, 2006.01]
27/187	• • • with manganese, technetium or rhenium [5, 2006.01]	29/44	• • • • • Noble metals [6, 2006.01]
27/188	• • • with chromium, molybdenum, tungsten or polonium [4, 5, 2006.01]	29/46	• • • • • Iron group metals or copper [6, 2006.01]
27/19	• • • • Molybdenum [4, 5, 2006.01]	29/48	• • • • containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium [6, 2006.01]
27/192	• • • • • with bismuth [4, 5, 2006.01]		
27/195	• • • with vanadium, niobium or tantalum [4, 5, 2006.01]		
27/198	• • • • Vanadium [4, 5, 2006.01]		
27/199	• • • • • with chromium, molybdenum, tungsten or polonium [5, 2006.01]		
27/20	• Carbon compounds [2, 2006.01]		
27/22	• • Carbides [2, 2006.01]		
27/224	• • • Silicon carbide [4, 2006.01]		
27/228	• • • • with phosphorus, arsenic, antimony or bismuth [4, 2006.01]		
27/232	• • Carbonates [4, 2006.01]		
27/236	• • • Hydroxy carbonates [4, 2006.01]		
27/24	• Nitrogen compounds [2, 2006.01]		
27/25	• • Nitrates [4, 2006.01]		
27/26	• • Cyanides [2, 2006.01]		
27/28	• Regeneration or reactivation [2, 2006.01]		
27/30	• • of catalysts comprising compounds of sulfur, selenium or tellurium [2, 2006.01]		

- 29/50 • • • of the erionite or offretite type, e.g. zeolite T [6, 2006.01]
- 29/52 • • • • containing iron group metals, noble metals or copper [6, 2006.01]
- 29/54 • • • • • Noble metals [6, 2006.01]
- 29/56 • • • • • Iron group metals or copper [6, 2006.01]
- 29/58 • • • • • containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium [6, 2006.01]
- 29/60 • • • of the type L [6, 2006.01]
- 29/61 • • • • containing iron group metals, noble metals or copper [6, 2006.01]
- 29/62 • • • • • Noble metals [6, 2006.01]
- 29/63 • • • • • Iron group metals or copper [6, 2006.01]
- 29/64 • • • • • containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium [6, 2006.01]
- 29/65 • • • of the ferrierite type, e.g. types ZSM-21, ZSM-35 or ZSM-38 [6, 2006.01]
- 29/66 • • • • containing iron group metals, noble metals or copper [6, 2006.01]
- 29/67 • • • • • Noble metals [6, 2006.01]
- 29/68 • • • • • Iron group metals or copper [6, 2006.01]
- 29/69 • • • • • containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium [6, 2006.01]
- 29/70 • • • of types characterised by their specific structure not provided for in groups B01J 29/08-B01J 29/65 [6, 2006.01]
- 29/72 • • • • containing iron group metals, noble metals or copper [6, 2006.01]
- 29/74 • • • • • Noble metals [6, 2006.01]
- 29/76 • • • • • Iron group metals or copper [6, 2006.01]
- 29/78 • • • • • containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium [6, 2006.01]
- 29/80 • • • Mixtures of different zeolites [6, 2006.01]
- 29/82 • Phosphates [6, 2006.01]
- 29/83 • • Aluminophosphates [APO compounds] [6, 2006.01]
- 29/84 • • Aluminophosphates containing other elements, e.g. metals, boron [6, 2006.01]
- 29/85 • • • Silicoaluminophosphates [SAPO compounds] [6, 2006.01]
- 29/86 • Borosilicates; Aluminoborosilicates [6, 2006.01]
- 29/87 • Gallosilicates; Aluminogallosilicates; Galloborosilicates [6, 2006.01]
- 29/88 • Ferrosilicates; Ferroaluminosilicates [6, 2006.01]
- 29/89 • Silicates, aluminosilicates or borosilicates of titanium, zirconium or hafnium [6, 2006.01]
- 29/90 • Regeneration or reactivation [6, 2006.01]
- 31/00 Catalysts comprising hydrides, coordination complexes or organic compounds (catalyst compositions used only in polymerisation reactions C08) [2, 2006.01]**

Note(s) [2]

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

- 31/02 • containing organic compounds or metal hydrides [2, 2006.01]
- 31/04 • • containing carboxylic acids or their salts [2, 2006.01]
- 31/06 • • containing polymers [2, 2006.01]
- 31/08 • • • Ion-exchange resins [2, 2006.01]
- 31/10 • • • • sulfonated [2, 2006.01]
- 31/12 • • containing organo-metallic compounds or metal hydrides [2, 2006.01]
- 31/14 • • • of aluminium or boron [2, 2006.01]
- 31/16 • containing coordination complexes [2, 2006.01]
- 31/18 • • containing nitrogen, phosphorus, arsenic or antimony [2, 2006.01]
- 31/20 • • Carbonyls [2, 2006.01]
- 31/22 • • Organic complexes [2, 2006.01]
- 31/24 • • Phosphines [2, 2006.01]
- 31/26 • containing in addition, inorganic metal compounds not provided for in groups B01J 31/02-B01J 31/24 [2, 2006.01]
- 31/28 • • of the platinum group metals, iron group metals or copper [2, 2006.01]
- 31/30 • • • Halides [2, 2006.01]
- 31/32 • • of manganese, technetium or rhenium [2, 2006.01]
- 31/34 • • of chromium, molybdenum or tungsten [2, 2006.01]
- 31/36 • • of vanadium, niobium or tantalum [2, 2006.01]
- 31/38 • • of titanium, zirconium or hafnium [2, 2006.01]
- 31/40 • Regeneration or reactivation [2, 2006.01]

Note(s) [6, 2006.01]

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, 2006.01]

33/00 Protection of catalysts, e.g. by coating [2, 2006.01]

35/00 Catalysts, in general, characterised by their form or physical properties [2, 2006.01, 2024.01]

- 35/20 • characterised by their non-solid state [2024.01]
- 35/23 • • in a colloidal state [2024.01]
- 35/27 • • in a liquid or molten state [2024.01]
- 35/30 • characterised by their physical properties [2024.01]
- 35/31 • • Density [2024.01]
- 35/32 • • • Bulk density [2024.01]
- 35/33 • • Electric or magnetic properties [2024.01]
- 35/34 • • Mechanical properties [2024.01]
- 35/36 • • • Mechanical strength [2024.01]
- 35/37 • • • Crush or impact strength [2024.01]
- 35/38 • • • Abrasion or attrition resistance [2024.01]

35/39	• • Photocatalytic properties [2024.01]	38/00	Regeneration or reactivation of catalysts, in general [4, 2006.01]
35/40	• characterised by dimensions, e.g. grain size (in a colloidal state B01J 35/23; crystallite size B01J 35/77) [2024.01]	38/02	• Heat treatment [4, 2006.01]
35/45	• • Nanoparticles [2024.01]	38/04	• Gas or vapour treating; Treating by using liquids vaporisable upon contacting spent catalyst [4, 2006.01]
35/50	• characterised by their shape or configuration [2024.01]	38/06	• • using steam [4, 2006.01]
35/51	• • Spheres [2024.01]	38/08	• • using ammonia or derivatives thereof [4, 2006.01]
35/52	• • • Hollow spheres [2024.01]	38/10	• • using elemental hydrogen [4, 2006.01]
35/53	• • • with a core-shell structure [2024.01]	38/12	• • Treating with free oxygen-containing gas [4, 2006.01]
35/54	• • Bars or plates [2024.01]	38/14	• • • with control of oxygen content in oxidation gas [4, 2006.01]
35/55	• • Cylinders or rings [2024.01]	38/16	• • • Oxidation gas comprising essentially steam and oxygen [4, 2006.01]
35/56	• • Foraminous structures having flow-through passages or channels, e.g. grids or three-dimensional monoliths [2024.01]	38/18	• • • with subsequent reactive gas treating [4, 2006.01]
35/57	• • • Honeycombs [2024.01]	38/20	• • • Plural distinct oxidation stages [4, 2006.01]
35/58	• • Fabrics or filaments [2024.01]	38/22	• • • Moving bed, e.g. vertically or horizontally moving bulk [4, 2006.01]
35/59	• • • Membranes [2024.01]	38/24	• • • • having mainly transverse, i.e. lateral, flow of oxygen-containing gas and material [4, 2006.01]
35/60	• characterised by their surface properties or porosity [2024.01]	38/26	• • • • having mainly counter-current flow of oxygen-containing gas and material [4, 2006.01]
35/61	• • Surface area [2024.01]	38/28	• • • • having mainly concurrent flow of oxygen-containing gas and material [4, 2006.01]
35/63	• • Pore volume [2024.01]	38/30	• • • in gaseous suspension, e.g. fluidised bed [4, 2006.01]
35/64	• • Pore diameter [2024.01]	38/32	• • • • Indirectly heating or cooling material within regeneration zone or prior to entry into regeneration zone [4, 2006.01]
35/66	• • Pore distribution [2024.01]	38/34	• • • • with plural distinct serial combustion stages [4, 2006.01]
35/67	• • • monomodal [2024.01]	38/36	• • • • and with substantially complete oxidation of carbon monoxide to carbon dioxide within regeneration zone [4, 2006.01]
35/69	• • • bimodal [2024.01]	38/38	• • • and adding heat by solid heat carrier [4, 2006.01]
35/70	• characterised by their crystalline properties, e.g. semi-crystalline (catalysts comprising carbon B01J 21/18; molecular sieves B01J 29/00) [2024.01]	38/40	• • • and forming useful by-products [4, 2006.01]
35/73	• • having a two-dimensional layered crystalline structure, e.g. layered double hydroxide [LDH] [2024.01]	38/42	• • using halogen-containing material [4, 2006.01]
35/77	• • Compounds characterised by their crystallite size [2024.01]	38/44	• • • and adding simultaneously or subsequently free oxygen; using oxyhalogen compound [4, 2006.01]
35/80	• characterised by their amorphous structures [2024.01]	38/46	• • • fluorine-containing [4, 2006.01]
37/00	Processes, in general, for preparing catalysts; Processes, in general, for activation of catalysts [4, 2006.01]	38/48	• Liquid treating or treating in liquid phase, e.g. dissolved or suspended [4, 2006.01]
37/02	• Impregnation, coating or precipitation (protecting by coating B01J 33/00) [2, 2006.01]	38/50	• • using organic liquids [4, 2006.01]
37/025	• • using a distinct intermediate layer, e.g. substrate-support-active layer [6, 2006.01]	38/52	• • • oxygen-containing [4, 2006.01]
37/03	• • Precipitation; Co-precipitation [4, 2006.01]	38/54	• • • halogen-containing [4, 2006.01]
37/04	• Mixing [2, 2006.01]	38/56	• • • Hydrocarbons [4, 2006.01]
37/06	• Washing [2, 2006.01]	38/58	• • • and gas addition thereto [4, 2006.01]
37/08	• Heat treatment [2, 2006.01]	38/60	• • using acids [4, 2006.01]
37/10	• • in the presence of water, e.g. steam [2, 2006.01]	38/62	• • • organic [4, 2006.01]
37/12	• Oxidising [2, 2006.01]	38/64	• • using alkaline material; using salts [4, 2006.01]
37/14	• • with gases containing free oxygen [2, 2006.01]	38/66	• • • using ammonia or derivatives thereof [4, 2006.01]
37/16	• Reducing [2, 2006.01]	38/68	• • including substantial dissolution or chemical precipitation of a catalyst component in the ultimate reconstitution of the catalyst [4, 2006.01]
37/18	• • with gases containing free hydrogen [2, 2006.01]	38/70	• • Wet oxidation of material submerged in liquid [4, 2006.01]
37/20	• Sulfiding [2, 2006.01]	38/72	• including segregation of diverse particles [4, 2006.01]
37/22	• Halogenating [2, 2006.01]	38/74	• utilising ion-exchange [4, 2006.01]
37/24	• • Chlorinating [2, 2006.01]		
37/26	• • Fluorinating [2, 2006.01]		
37/28	• Phosphorising [2, 2006.01]		
37/30	• Ion-exchange [2, 2006.01]		
37/32	• Freeze drying, i.e. lyophilisation [2, 2006.01]		
37/34	• Irradiation by, or application of, electric, magnetic or wave energy, e.g. ultrasonic waves [2, 2006.01]		
37/36	• Biochemical methods [2, 2006.01]		

Ion-exchange [3]**Note(s) [3]**

- 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.
- In groups B01J 39/00-B01J 49/00, the last place priority rule is applied, i.e. at each hierarchical level, 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, 2006.01]
- 39/04 • Processes using organic exchangers [3, 2006.01, 2017.01]
- 39/05 • • in the strongly acidic form [2017.01]
- 39/07 • • in the weakly acidic form [2017.01]
- 39/08 • Use of material as cation exchangers; Treatment of material for improving the cation exchange properties [3, 2006.01, 2017.01]
- 39/09 • • Inorganic material [2017.01]
- 39/10 • • Oxides or hydroxides [3, 2006.01]
- 39/12 • • Compounds containing phosphorus [3, 2006.01]
- 39/14 • • Base exchange silicates, e.g. zeolites [3, 2006.01]
- 39/16 • • Organic material [3, 2006.01, 2017.01]
- 39/17 • • • containing also inorganic materials, e.g. inert material coated with an ion-exchange resin [2017.01]
- 39/18 • • • Macromolecular compounds (B01J 39/17 takes precedence) [3, 2006.01, 2017.01]
- 39/19 • • • • obtained otherwise than by reactions only involving unsaturated carbon-to-carbon bonds [2017.01]
- 39/20 • • • • obtained by reactions only involving unsaturated carbon-to-carbon bonds [3, 2006.01]
- 39/22 • • • • Cellulose or wood; Derivatives thereof [3, 2006.01]
- 39/24 • • Carbon, coal or tar [3, 2006.01, 2017.01]
- 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, 2006.01]
- 41/04 • Processes using organic exchangers [3, 2006.01, 2017.01]
- 41/05 • • in the strongly basic form [2017.01]
- 41/07 • • in the weakly basic form [2017.01]
- 41/08 • Use of material as anion exchangers; Treatment of material for improving the anion exchange properties [3, 2006.01, 2017.01]
- 41/09 • • Organic material [2017.01]
- 41/10 • • Inorganic material [3, 2006.01]
- 41/12 • • Macromolecular compounds [3, 2006.01, 2017.01]

- 41/13 • • • obtained otherwise than by reactions only involving unsaturated carbon-to-carbon bonds [2017.01]
- 41/14 • • • obtained by reactions only involving unsaturated carbon-to-carbon bonds [3, 2006.01]
- 41/16 • • • Cellulose or wood; Derivatives thereof [3, 2006.01]
- 41/18 • • Carbon, coal or tar [3, 2006.01, 2017.01]
- 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, 2017.01]
- 47/011 • using batch processes [2017.01]
- 47/012 • using portable ion-exchange apparatus [2017.01]
- 47/014 • in which the adsorbent properties of the ion-exchanger are involved, e.g. recovery of proteins or other high-molecular compounds [2017.01]
- 47/015 • Electron-exchangers [2017.01]
- 47/016 • Modification or after-treatment of ion-exchangers [2017.01]
- 47/018 • Granulation; Incorporation of ion-exchangers in a matrix; Mixing with inert materials [2017.01]
- 47/019 • • Mixtures in form of tablets [2017.01]
- 47/02 • Column or bed processes [3, 2006.01, 2017.01]
- 47/022 • • characterised by the construction of the column or container [2017.01]
- 47/024 • • • where the ion-exchangers are in a removable cartridge [2017.01]
- 47/026 • • using columns or beds of different ion exchange materials in series [2017.01]
- 47/028 • • • with alternately arranged cationic and anionic exchangers [2017.01]
- 47/04 • • Mixed-bed processes [3, 2006.01]
- 47/06 • • during which the ion-exchange material is subjected to a physical treatment, e.g. heat, electric current, irradiation or vibration (electrodialysis or electro-osmosis B01D 61/42) [3, 2006.01]
- 47/08 • • • subjected to a direct electric current [3, 2006.01]
- 47/10 • with moving ion-exchange material; with ion-exchange material in suspension or in fluidised-bed form [3, 2006.01, 2017.01]
- 47/11 • • in rotating beds [2017.01]
- 47/12 • characterised by the use of ion-exchange material in the form of ribbons, filaments, fibres or sheets, e.g. membranes (electrodialysis or electro-osmosis B01D 61/42) [3, 2006.01, 2017.01]
- 47/127 • • in the form of filaments or fibres [2017.01]
- 47/133 • • Precoat filters [2017.01]
- 47/14 • Controlling or regulating [3, 2006.01, 2017.01]

- 47/15 • • for obtaining a solution having a fixed pH [2017.01]
- 49/00 Regeneration or reactivation of ion-exchangers; Apparatus therefor** (ion-exchange chromatography processes or apparatus B01D 15/08) [3, 2006.01, 2017.01]
- 49/05 • • of fixed beds [2017.01]
- 49/06 • • containing cationic exchangers [2017.01]
- 49/07 • • containing anionic exchangers [2017.01]
- 49/08 • • containing cationic and anionic exchangers in separate beds [2017.01]
- 49/09 • • of mixed beds [2017.01]
- 49/10 • • of moving beds [2017.01]
- 49/12 • • containing cationic exchangers [2017.01]
- 49/14 • • containing anionic exchangers [2017.01]
- 49/16 • • containing cationic and anionic exchangers in separate beds [2017.01]

- 49/18 • • of mixed beds [2017.01]
- 49/20 • • of membranes [2017.01]
- 49/30 • Electrical regeneration [2017.01]
- 49/40 • Thermal regeneration [2017.01]
- 49/45 • • of amphoteric ion-exchangers [2017.01]
- 49/50 • characterised by the regeneration reagents [2017.01]
- 49/53 • • for cationic exchangers [2017.01]
- 49/57 • • for anionic exchangers [2017.01]
- 49/60 • Cleaning or rinsing ion-exchange beds [2017.01]
- 49/70 • for large scale industrial processes or applications [2017.01]
- 49/75 • of water softeners [2017.01]
- 49/80 • Automatic regeneration [2017.01]
- 49/85 • • Controlling or regulating devices therefor [2017.01]
- 49/90 • having devices which prevent back-flow of the ion-exchange mass during regeneration [2017.01]