SECTION B — PERFORMING OPERATIONS; TRANSPORTING

B01 PHYSICAL OR CHEMICAL PROCESSES OR APPARATUS IN GENERAL

B01B BOILING; BOILING APPARATUS

1/00 Boiling; Boiling apparatus for physical or chemical purposes [1, 2, 2006.01]
1/02 • Preventing foaming **[1, 2006.01]**
1/04 • • by chemical means **[1, 2006.01]**
1/06 • Preventing bumping **[1, 2006.01]**
1/08 • Boiling apparatus provided with reflux condenser **[1, 2006.01]**

B01D SEPARATION (separating solids from solids by wet methods B03B, B03D, by pneumatic jigs or tables B03B, by other dry methods B07; magnetic or electrostatic separation of solid materials from solid materials or fluids, separation by high-voltage electric fields B03C; centrifuges B04B; vortex apparatus B04C; presses per se for squeezing-out liquid from liquid-containing material B30B 9/02) **[5]**

Note(s) [5]

1. This subclass covers :
   - evaporation, distillation, crystallisation, filtration, dust precipitation, gas cleaning, absorption, adsorption;
   - similar processes which are not concerned with, or limited to, separation, except in the case of absorption or adsorption.
2. In this subclass, the terms or expressions are used with the meaning indicated:
   - "filtration" and analogous terms include straining solids from fluids. Filtration is a process that normally uses a filter medium;
   - "filter medium" is a porous material or porous arrangement of material used to filter solids from fluids;
   - "filtering element" is a section of filter medium in addition to parts to which the medium is demountably or permanently fixed, including other sections of medium, end caps, peripheral frames or edge strips, but excluding housings;
   - "filter housing" is the fluid-constraining impervious vessel, whether open or closed, which contains, or is adapted to contain, one or more filtering elements or filter media;
   - "filter chamber" is the space within a housing, where filtering elements or filter media are located. Partitions may divide a single housing into a plurality of chambers;
   - "filtering apparatus" consists of filtering elements combined with housings, cleaning arrangements, motor or the like parts, which are characteristic of the particular type of apparatus. Ancillary devices such as pumps or valves are considered part of a filtering apparatus when inside the apparatus. Ancillary devices performing similar or different unit operation such as comminutors, mixers or non-filtering separators, whether or not inside the apparatus, are not considered part of a filtering apparatus. The term does not extend to apparatus, e.g. washing machines, of which the filter forms only a part.
3. For apparatus used in drying or evaporation, class F26 takes precedence over this subclass.
4. Group B01D 59/00 takes precedence over the other groups of this subclass and over other subclasses in class B01.

Subclass index

EVAPORATION; DISTILLATION; SUBLIMATION....1/00, 3/00, 5/00, 7/00
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CRYSTALLISATION....9/00
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TREATING GASES OR VAPOURS: SEPARATION, RECOVERING, CHEMICAL OR BIOLOGICAL PURIFICATION OF WASTE GASES....53/00
SEPARATION OF SUSPENDED PARTICLES FROM LIQUIDS
By sedimentation....21/00
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processes....37/00
gravity filters; filters formed from filtering elements, pressure or suction filters....24/00, 25/00, 29/00
cartridge filters....27/00
filters with mobile filtering elements....33/00
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filter circuits or combinations....36/00
By other processes....43/00

SEPARATION OF DISPERSED PARTICLES FROM GASES OR VAPOURS
Pretreatment of the gas or vapour....51/00
By gravity, inertia, centrifugal force; by filtration; by a combination of devices....45/00, 46/00, 50/00
By other methods....47/00, 49/00
FILTERING MATERIALS....39/00, 41/00
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ABSORPTION, ADSORPTION, CHROMATOGRAPHY; OTHER SEPARATING METHODS....15/00, 15/08, 53/02, 53/14, 57/00
SEPARATION USING SEMI-PERMEABLE MEMBRANES; DIALYSIS, OSMOSIS, ULTRAFILTRATION....61/00-71/00

1/00 **Evaporating** (drying solid materials or objects by evaporating liquids therefrom F26B) **[1, 2006.01]**

1/02 • Evaporators with heating coils **[1, 2006.01]**

1/04 • Evaporators with horizontal tubes **[1, 2006.01]**

1/06 • Evaporators with vertical tubes **[1, 2006.01]**

1/08 • • with short tubes (B01D 1/12 takes precedence) **[1, 2006.01]**

1/10 • • with long tubes, e.g. Kestner evaporators (B01D 1/12 takes precedence) **[1, 2006.01]**

1/12 • • and forced circulation **[1, 2006.01]**

1/14 • with heated gases or vapours in contact with the liquid **[1, 2006.01]**

1/16 • by spraying (B01D 1/22 takes precedence) **[1, 2006.01]**

1/18 • • to obtain dry solids (B01D 1/24 takes precedence) **[1, 2006.01]**

1/20 • • Sprayers **[1, 2006.01]**

1/22 • by bringing a thin layer of the liquid into contact with a heated surface **[1, 2006.01]**

1/24 • • to obtain dry solids **[1, 2006.01]**

1/26 • Multiple-effect evaporating **[1, 2006.01]**

1/28 • with vapour compression **[1, 2006.01]**

1/30 • Accessories for evaporators **[1, 2006.01]**

3/00 **Distillation or related exchange processes in which liquids are contacted with gaseous media, e.g. stripping [1, 2, 2006.01]**

3/02 • in boilers or stills **[1, 2, 2006.01]**

3/04 • pipe stills **[1, 2006.01]**

3/06 • Flash distillation **[1, 2, 2006.01]**

3/08 • in rotating vessels; Atomisation on rotating discs (B01D 3/10 takes precedence) **[1, 2006.01]**

3/10 • Vacuum distillation (B01D 3/12 takes precedence) **[1, 2, 2006.01]**

3/12 • Molecular distillation **[1, 2, 2006.01]**

3/14 • Fractional distillation **[1, 2006.01]**

3/16 • • Fractionating columns in which vapour bubbles through liquid **[1, 2006.01]**

3/18 • • • with horizontal bubble plates **[1, 2006.01]**

3/20 • • • • Bubble caps; Risers for vapour; Discharge pipes for liquid **[1, 2006.01]**

3/22 • • • with horizontal sieve plates or grids; Construction of sieve plates or grids **[1, 2006.01]**

3/24 • • • with sloping plates or elements mounted stepwise **[1, 2006.01]**

3/26 • • Fractionating columns in which vapour and liquid flow pass each other, or in which the fluid is sprayed into the vapour, or in which a two-phase mixture is passed in one direction **[1, 2006.01]**

3/28 • • • Fractionating columns with surface contact and vertical guides, e.g. film action **[1, 2006.01]**

3/30 • • Fractionating columns with movable parts or in which centrifugal movement is caused **[1, 2006.01]**

3/32 • • Other features of fractionating columns **[1, 2006.01]**

3/34 • with one or more auxiliary substances **[1, 2006.01]**

3/36 • • Azeotropic distillation **[1, 2006.01]**

3/38 • • Steam distillation **[1, 2006.01]**

3/40 • • Extractive distillation **[1, 2006.01]**

3/42 • Regulation; Control **[1, 2006.01]**

5/00 **Condensation of vapours; Recovering volatile solvents by condensation** (B01D 8/00 takes precedence; condensers F28B) **[1, 3, 2006.01]**

7/00 **Sublimation** (B01D 8/00 takes precedence; freeze-drying F26) **[1, 2006.01]**

7/02 • Crystallisation directly from the vapour phase (into single crystals C30B 23/00) **[2, 2006.01]**

8/00 **Cold traps; Cold baffles [3, 2006.01]**

9/00 **Crystallisation** (crystallisation directly from the vapour phase B01D 7/02; making single crystals C30B) **[1, 2006.01]**

9/02 • from solutions **[1, 2006.01]**

9/04 • • concentrating solutions by removing frozen solvent therefrom **[1, 2006.01]**

11/00 **Solvent extraction [1, 2006.01]**

11/02 • of solids **[1, 2006.01]**

11/04 • of solutions which are liquid **[1, 2006.01]**

12/00 **Displacing liquid, e.g. from wet solids or from dispersions of liquids or from solids in liquids, by means of another liquid [1, 2006.01]**

15/00 **Separating processes involving the treatment of liquids with solid sorbents; Apparatus therefor [1, 4, 2006.01]**

15/02 • with moving adsorbents **[1, 2006.01]**

15/04 • with ion-exchange materials as adsorbents (B01D 15/36 takes precedence) **[1, 2006.01]**

15/08 • Selective adsorption, e.g. chromatography **[1, 2006.01]**

Note(s) [2006.01]

In order that group B01D 15/08 may provide a basis for a complete search with respect to chromatography in general, all subject matter of general interest is classified in this group even if it is classified primarily in the application-oriented groups, for example dairy products A23C 9/148, treatment of blood e.g. A61M 1/36, optically active organic compounds C07B 57/00 or peptides C07K 1/16.

15/10 • • characterised by constructional or operational features **[2006.01]**

15/12 • • • relating to the preparation of the feed **[2006.01]**

15/14 • • • relating to the introduction of the feed to the apparatus **[2006.01]**

15/16 • • • relating to the conditioning of the fluid carrier **[2006.01]**
15/18 • • • relating to flow patterns **[2006.01]**
15/20 • • • relating to the conditioning of the sorbent material **[2006.01]**
15/22 • • • relating to the construction of the column **[2006.01]**
15/24 • • • relating to the treatment of the fractions to be distributed **[2006.01]**
15/26 • • characterised by the separation mechanism **[2006.01]**
15/30 • • • Partition chromatography **[2006.01]**
15/32 • • • Bonded phase chromatography, e.g. with normal bonded phase, reversed phase or hydrophobic interaction **[2006.01]**
15/34 • • • Size-selective separation, e.g. size-exclusion chromatography; Gel filtration; Permeation **[2006.01]**
15/36 • • • involving ionic interaction, e.g. ion-exchange, ion-pair, ion-suppression or ion-exclusion **[2006.01]**
15/38 • • • involving specific interaction not covered by one or more of groups B01D 15/30-B01D 15/36, e.g. affinity, ligand exchange or chiral chromatography **[2006.01]**
15/40 • • • using supercritical fluid as mobile phase or eluent **[2006.01]**
15/42 • • characterised by the development mode, e.g. by displacement or by elution **[2006.01]**

17/00 Separation of liquids, not provided for elsewhere, e.g. by thermal diffusion [1, 2006.01]
17/02 • Separation of non-miscible liquids **[1, 2006.01]**
17/022 • • by contact with a preferentially wettable solid **[4, 2006.01]**
17/025 • • by gravity, in a settling tank **[4, 2006.01]**
17/028 • • • provided with a set of baffles **[4, 2006.01]**
17/032 • • • provided with special equipment for removing at least one of the separated liquids **[4, 2006.01]**
17/035 • • by using gas-bubbles or moving solids introduced into the mixture **[4, 2006.01]**
17/038 • • by centrifugal force (centrifuges B04B; cyclones B04C) **[4, 2006.01]**
17/04 • • Breaking emulsions **[1, 2006.01]**
17/05 • • • by chemical treatment **[4, 2006.01]**
17/06 • Separation of liquids from each other by electricity **[1, 2006.01]**
17/09 • by thermal diffusion **[4, 2006.01]**
17/12 • Auxiliary equipment particularly adapted for use with liquid-separating apparatus, e.g. control circuits **[4, 2006.01]**

19/00 Degasification of liquids [1, 2006.01]
19/02 • Foam dispersion or prevention **[1, 2006.01]**
19/04 • • by addition of chemical substances **[1, 2006.01]**

21/00 Separation of suspended solid particles from liquids by sedimentation (differential sedimentation B03D 3/00) **[1, 2006.01]**
21/01 • using flocculating agents **[1, 2, 2006.01]**
21/02 • Settling tanks **[1, 4, 2006.01]**
21/04 • • with moving scrapers **[1, 2006.01]**
21/06 • • • with rotating scrapers **[1, 2006.01]**
21/08 • • provided with flocculating compartments **[1, 2006.01]**
21/18 • Construction of the scrapers or the driving mechanisms for settling tanks **[1, 2006.01]**
21/20 • • Driving mechanisms **[1, 2006.01]**
21/22 • • Safety mechanisms **[1, 2006.01]**
21/24 • Feed or discharge mechanisms for settling tanks **[1, 2006.01]**
21/26 • Separation of sediment aided by centrifugal force **[1, 2006.01]**
21/28 • Mechanical auxiliary equipment for acceleration of sedimentation, e.g. by vibrators or the like **[4, 2006.01]**
21/30 • Control equipment **[4, 2006.01]**
21/32 • • Density control of clear liquid or sediment, e.g. optical control **[4, 2006.01]**
21/34 • • Controlling the feed distribution; Controlling the liquid level **[4, 2006.01]**

Filtration; Filtering material, regeneration thereof [2]

24/00 Filters comprising loose filtering material, i.e. filtering material without any binder between the individual particles or fibres thereof (B01D 27/02 takes precedence) **[5, 2006.01]**
24/02 • with the filter bed stationary during the filtration **[5, 2006.01]**
24/04 • • the filtering material being clamped between pervious fixed walls (B01D 24/10, B01D 24/20 take precedence) **[5, 2006.01]**
24/06 • • • the pervious walls comprising a series of louvres or slots **[5, 2006.01]**
24/08 • • • the filtering material being supported by at least two pervious coaxial walls **[5, 2006.01]**
24/10 • • the filtering material being held in a closed container **[5, 2006.01]**
24/12 • • • Downward filtration, the filtering material being supported by pervious surfaces (B01D 24/18 takes precedence) **[5, 2006.01]**
24/14 • • • Downward filtration, the container having distribution or collection headers or pervious conduits (B01D 24/18 takes precedence) **[5, 2006.01]**
24/16 • • • Upward filtration (B01D 24/18 takes precedence) **[5, 2006.01]**
24/18 • • • Combined upward and downward filtration **[5, 2006.01]**
24/20 • • the filtering material being provided in an open container **[5, 2006.01]**
24/22 • • • Downward filtration, the filter material being supported by pervious surfaces **[5, 2006.01]**
24/24 • • • Downward filtration, the container having distribution or collection headers or pervious conduits **[5, 2006.01]**
24/26 • • • Upward filtration **[5, 2006.01]**
24/28 • with the filter bed moving during the filtration (with the filter bed fluidised B01D 24/36) **[5, 2006.01]**
24/30 • • Translation **[5, 2006.01]**
24/32 • • Rotation **[5, 2006.01]**
24/34 • with the filtering material and its pervious support moving (tipping buckets, trays or like sections B01D 33/327) **[5, 2006.01]**
24/36 • with the filter bed fluidised during the filtration (with the filter bed being stationary B01D 24/02) **[5, 2006.01]**
24/38 • Feed or discharge devices **[5, 2006.01]**
24/40 • • for feeding **[5, 2006.01]**
24/42 • • for discharging filtrate **[5, 2006.01]**
24/44 • • for discharging filter cake, e.g. chutes **[5, 2006.01]**

24/46 • Regenerating the filtering material in the filter (B01D 24/44 takes precedence) **[5, 2006.01]**

24/48 • integrally combined with devices for controlling the filtration **[5, 2006.01]**

25/00 Filters formed by clamping together several filtering elements or parts of such elements (disc filters B01D 29/39) **[1, 5, 2006.01]**

25/02 • in which the elements are pre-formed independent filtering units, e.g. modular systems **[1, 2006.01]**

25/12 • Filter presses, i.e. of the plate or plate and frame type **[1, 2006.01]**

25/127 • • with one or more movable filter bands arranged to be clamped between the press plates or between a plate and a frame during filtration, e.g. zigzag endless filter bands (B01D 25/172, B01D 25/176, B01D 25/19 take precedence) **[5, 2006.01]**

25/133 • • • with compression of the filter cake, e.g. by inflatable membranes **[5, 2006.01]**

25/164 • • Chamber-plate presses, i.e. the sides of the filtering elements being clamped between two successive filtering plates (B01D 25/127, B01D 25/172, B01D 25/176, B01D 25/19 take precedence) **[5, 2006.01]**

25/168 • • • with compression of the filter cake, e.g. by inflatable membranes **[5, 2006.01]**

25/172 • • Plate spreading means (removal of filter cakes B01D 25/32) **[5, 2006.01]**

25/176 • • attaching the filter element to the filter press plates, e.g. around the central feed hole in the plates **[5, 2006.01]**

25/19 • • Clamping means for closing the filter press, e.g. hydraulic jacks **[5, 2006.01]**

25/21 • • Plate and frame presses (B01D 25/172, B01D 25/176, B01D 25/19 take precedence) **[5, 2006.01]**

25/22 • Cell-type filters **[1, 2006.01]**

25/24 • • Cell-type roll filters **[1, 2006.01]**

25/26 • • Cell-type stack filters **[1, 2006.01]**

25/28 • Leaching or washing filter cakes in the filter **[1, 2006.01]**

25/30 • Feeding devices **[1, 2006.01]**

25/32 • Removal of filter cakes **[1, 2006.01]**

25/34 • • by moving the filter elements **[1, 2006.01]**

25/36 • • • by centrifugal force **[1, 2006.01]**

25/38 • • by moving parts, e.g. scrapers, contacting stationary filter elements **[1, 2006.01]**

27/00 Cartridge filters of the throw-away type [1, 5, 2006.01]

27/02 • with cartridges made from a mass of loose material **[1, 2006.01]**

27/04 • with cartridges made of a piece of unitary material, e.g. filter paper **[1, 2006.01]**

27/06 • • with corrugated, folded or wound material **[1, 2006.01]**

27/07 • • • having a coaxial stream through the filtering element **[5, 2006.01]**

27/08 • Construction of the casing **[1, 2006.01]**

27/10 • Safety devices, e.g. by-passes **[1, 2006.01]**

27/14 • having more than one filtering element **[5, 2006.01]**

29/00 Filters with filtering elements stationary during filtration, e.g. pressure or suction filters, not covered by groups B01D 24/00-B01D 27/00; Filtering elements therefor [1, 2006.01]

29/01 • with flat filtering elements (B01D 29/39 takes precedence) **[5, 2006.01]**

29/03 • • self-supporting **[5, 2006.01]**

29/05 • • supported **[5, 2006.01]**

29/07 • • • with corrugated, folded or wound filtering sheets **[5, 2006.01]**

29/075 • • located in a closed housing and comprising scrapers or agitators on the cake side of the filtering elements, e.g. Nutsche- or Rosenmund-type filters for performing multiple step operations such as chemical reactions, filtering and cake treatment **[5, 2006.01]**

Note(s) [5]

If the subject matter classified in this group also contains relevant information covered by other subgroups of group B01D 29/00, it is also classified in the other appropriate subgroups of group B01D 29/00.

29/085 • Funnel filters; Holders therefor **[5, 2006.01]**

Note(s) [5]

If the subject matter classified in this group also contains relevant information covered by other subgroups of group B01D 29/00, it is also classified in the other appropriate subgroups of group B01D 29/00.

29/09 • with filtering bands, e.g. movable between filtering operations **[5, 2006.01]**

29/11 • with bag, cage, hose, tube, sleeve or like filtering elements **[5, 2006.01]**

29/13 • • Supported filter elements **[5, 2006.01]**

29/15 • • • arranged for inward flow filtration **[5, 2006.01]**

29/17 • • • • open-ended **[5, 2006.01]**

29/19 • • • • on solid frames with surface grooves or the like **[5, 2006.01]**

29/21 • • • • with corrugated, folded or wound sheets **[5, 2006.01]**

29/23 • • • arranged for outward flow filtration **[5, 2006.01]**

29/25 • • • • open-ended **[5, 2006.01]**

29/27 • • • • Filter bags **[5, 2006.01]**

29/31 • • Self-supporting filtering elements **[5, 2006.01]**

29/33 • • • arranged for inward flow filtration **[5, 2006.01]**

29/35 • • • arranged for outward flow filtration **[5, 2006.01]**

29/37 • • • open-ended **[5, 2006.01]**

29/39 • with hollow discs side by side on, or around, one or more tubes, e.g. of the leaf type **[5, 2006.01]**

29/41 • • mounted transversely on the tube **[5, 2006.01]**

29/43 • • mounted otherwise than transversely on the tube **[5, 2006.01]**

29/44 • Edge filtering elements, i.e. using contiguous impervious surfaces **[4, 2006.01]**

29/46 • • of flat, stacked bodies **[4, 2006.01]**

29/48 • • of spirally or helically wound bodies **[4, 2006.01]**

29/50 • with multiple filtering elements, characterised by their mutual disposition (B01D 29/39 takes precedence) **[5, 2006.01]**

29/52 • • in parallel connection **[5, 2006.01]**

29/54 • • • arranged concentrically or coaxially **[5, 2006.01]**

29/56 • • in series connection **[5, 2006.01]**

29/58 • • • arranged concentrically or coaxially **[5, 2006.01]**

29/60 • integrally combined with devices for controlling the filtration **[5, 2006.01]**

29/62 • Regenerating the filter material in the filter (devices for taking out of action one or more units of multi-unit filters, e.g. for regeneration, B01D 35/12) **[5, 2006.01]**
29/64 • • by scrapers, brushes or the like, acting on the cake side of the filtering element **[5, 2006.01]**
29/66 • • by flushing, e.g. counter-current air-bumps **[5, 2006.01]**
29/68 • • • with backwash arms, shoes or nozzles **[5, 2006.01]**
29/70 • • by forces created by movement of the filter element **[5, 2006.01]**
29/72 • • • involving vibrations **[5, 2006.01]**
29/74 • • • involving centrifugal force **[5, 2006.01]**
29/76 • Handling the filter cake in the filter for purposes other than for regenerating (B01D 29/94 takes precedence) **[5, 2006.01]**
29/78 • • for washing **[5, 2006.01]**
29/80 • • for drying **[5, 2006.01]**
29/82 • • • by compression **[5, 2006.01]**
29/84 • • • by gases or by heating **[5, 2006.01]**
29/86 • • Retarding cake deposition on the filter during the filtration period, e.g. using stirrers **[5, 2006.01]**
29/88 • having feed or discharge devices **[5, 2006.01]**
29/90 • • for feeding **[5, 2006.01]**
29/92 • • for discharging filtrate **[5, 2006.01]**
29/94 • • for discharging the filter cake, e.g. chutes **[5, 2006.01]**
29/96 • in which the filtering elements are moved between filtering operations; Particular measures for removing or replacing the filtering elements; Transport systems for filters (B01D 29/09, B01D 29/70 take precedence) **[5, 2006.01]**

33/00 Filters with filtering elements which move during the filtering operation (filters comprising loose filtering material moving or fluidised during filtration B01D 24/28-B01D 24/36; centrifuges B04B) **[1, 5, 2006.01]**

33/01 • with translationally moving filtering elements, e.g. pistons (B01D 33/04-B01D 33/327 take precedence) **[5, 2006.01]**
33/03 • • with vibrating filter elements **[5, 2006.01]**
33/04 • with filtering bands or the like supported on cylinders which are impervious for filtering **[1, 5, 2006.01]**
33/044 • with filtering bands or the like supported on cylinders which are pervious for filtering **[5, 2006.01]**
33/048 • • with endless filtering bands **[5, 2006.01]**
33/052 • • • combined with a compression device (B01D 33/64 takes precedence) **[5, 2006.01]**
33/056 • Construction of filtering bands or supporting belts, e.g. devices for centering, mounting or sealing the filtering bands or the supporting belts **[5, 2006.01]**
33/06 • with rotary cylindrical filtering surfaces, e.g. hollow drums (B01D 33/044 takes precedence) **[1, 2006.01]**
33/067 • • Construction of the filtering drums, e.g. mounting or sealing arrangements **[5, 2006.01]**
33/073 • • arranged for inward flow filtration **[5, 2006.01]**
33/09 • • • with surface cells independently connected to pressure distributors **[5, 2006.01]**
33/11 • • arranged for outward flow filtration **[5, 2006.01]**
33/13 • • • with surface cells independently connected to pressure distributors **[5, 2006.01]**
33/15 • with rotary plane filtering surfaces **[5, 2006.01]**
33/17 • • with rotary filtering tables (tables divided into separately tiltable buckets, trays or like sections B01D 33/327) **[5, 2006.01]**
33/19 • • • the table surface being divided in successively tilted sectors or cells, e.g. for discharging the filter cake **[5, 2006.01]**
33/21 • • with hollow filtering discs transversely mounted on a hollow rotary shaft **[5, 2006.01]**
33/23 • • • Construction of discs or component sectors thereof **[5, 2006.01]**
33/25 • • with hollow frames axially mounted on a hollow rotary shaft **[5, 2006.01]**
33/27 • with rotary filtering surfaces, which are neither cylindrical nor planar, e.g. helical surfaces **[5, 2006.01]**
33/29 • the movement of the filter elements being a combination of movements (B01D 33/19 takes precedence) **[5, 2006.01]**
33/31 • • Planetary movement **[5, 2006.01]**
33/327 • • Tipping buckets, trays or like sections **[5, 2006.01]**
33/333 • with individual filtering elements moving along a closed path (tipping buckets, trays or like sections B01D 33/327) **[5, 2006.01]**
33/35 • with multiple filtering elements characterised by their mutual disposition (B01D 33/21 takes precedence) **[5, 2006.01]**
33/37 • • in parallel connection **[5, 2006.01]**
33/39 • • • concentrically or coaxially **[5, 2006.01]**
33/41 • • in series connection **[5, 2006.01]**
33/42 • • • concentrically or coaxially **[5, 2006.01]**
33/44 • Regenerating the filter material in the filter (devices for taking out of action one or more units of multi-unit filters, e.g. for regeneration, B01D 35/12) **[5, 2006.01]**
33/46 • • by scrapers, brushes or the like acting on the cake-side of the filtering element **[5, 2006.01]**
33/48 • • by flushing, e.g. counter-current air-bumps **[5, 2006.01]**
33/50 • • • with backwash arms, shoes or nozzles **[5, 2006.01]**
33/52 • • by forces created by movement of the filter element **[5, 2006.01]**
33/54 • • • involving vibrations **[5, 2006.01]**
33/56 • • • involving centrifugal force **[5, 2006.01]**
33/58 • Handling the filter cake in the filter for purposes other than for regenerating (B01D 33/76 takes precedence) **[5, 2006.01]**
33/60 • • for washing **[5, 2006.01]**
33/62 • • for drying **[5, 2006.01]**
33/64 • • • by compression **[5, 2006.01]**
33/66 • • • by gases or by heating **[5, 2006.01]**
33/68 • • Retarding cake deposition on the filter during the filtration period, e.g. using stirrers **[5, 2006.01]**
33/70 • having feed or discharge devices (B01D 33/82 takes precedence) **[5, 2006.01]**
33/72 • • for feeding **[5, 2006.01]**
33/74 • • for discharging filtrate **[5, 2006.01]**
33/76 • • for discharging the filter cake, e.g. chutes **[5, 2006.01]**
33/80 • Accessories **[5, 2006.01]**
33/82 • • Means for pressure distribution **[5, 2006.01]**

35/00 Filtering devices having features not specifically covered by groups B01D 24/00-B01D 33/00, or for applications not specifically covered by groups B01D 24/00-B01D 33/00; Auxiliary devices for filtration; Filter housing constructions [1, 2006.01]

35/01 • Devices for the removal of gas, e.g. air purge systems **[5, 2006.01]**

35/02 • Filters adapted for location in special places, e.g. pipe-lines, pumps, stop-cocks (B01D 35/05 takes precedence) **[1, 2006.01]**
35/027 • • rigidly mounted in or on tanks or reservoirs (B01D 35/04 takes precedence) **[5, 2006.01]**
35/04 • • Plug, tap, or cock filters **[1, 2006.01]**
35/05 • Floating filters **[5, 2006.01]**
35/06 • Filters making use of electricity or magnetism (ultrafiltration, microfiltration B01D 61/14; electrodialysis, electro-osmosis B01D 61/42; combinations of filters and magnetic separators B03C 1/30) **[1, 5, 2006.01]**
35/10 • Brush filters **[1, 2006.01]**
35/12 • Devices for taking out of action one or more units of multi-unit filters, e.g. for regeneration **[1, 2006.01]**
35/14 • Safety devices specially adapted for filtration; Devices for indicating clogging (incorporated in a throw-away filter B01D 27/10) **[1, 2006.01]**
35/143 • • Filter condition indicators **[5, 2006.01]**
35/147 • • Bypass or safety valves **[5, 2006.01]**
35/15 • • Bidirectional working filters **[5, 2006.01]**
35/153 • • Anti-leakage or anti-return valves **[5, 2006.01]**
35/157 • • Flow control valves; Damping or calibrated passages **[5, 2006.01]**
35/16 • Cleaning-out devices **[1, 2006.01]**
35/18 • Heating or cooling the filters **[1, 2006.01]**
35/20 • Vibrating the filters (regenerating filter material by vibrations in filters with stationary filtering elements B01D 29/72; discharging the filter cake by vibrations in filters with moving filtering elements B01D 33/54, B01D 33/76) **[1, 5, 2006.01]**
35/22 • Directing the mixture to be filtered on to the filters in a manner to clean the filters **[1, 2006.01]**
35/24 • Providing loose granular material to scratch the filters clean **[1, 2006.01]**
35/26 • Filters with built-in pumps **[1, 2006.01]**
35/28 • Strainers not provided for elsewhere **[1, 2006.01]**
35/30 • Filter housing constructions **[4, 2006.01]**
35/31 • • including arrangements for environmental protection, e.g. pressure resisting features **[5, 2006.01]**
35/32 • • • against radiation **[5, 2006.01]**
35/34 • • open-topped (B01D 35/31 takes precedence) **[5, 2006.01]**

36/00 Filter circuits or combinations of filters with other separating devices (devices for the removal of gas, e.g. air purge systems B01D 35/01; magnetic or electrostatic separators combined with filters B03C) **[4, 5, 2006.01]**
36/02 • Combinations of filters of different kinds (B01D 29/50, B01D 33/35 take precedence) **[4, 5, 2006.01]**
36/04 • Combinations of filters with settling tanks **[4, 2006.01]**

37/00 Processes of filtration (processes specially adapted for filtering gases B01D 46/00) **[1, 2006.01]**
37/02 • Precoating the filtering elements or material; Addition of filter aids to the liquid being filtered **[1, 2006.01]**
37/03 • using flocculating agents **[5, 2006.01]**
37/04 • Controlling the filtration **[1, 2006.01]**

39/00 Filtering material for liquid or gaseous fluids [1, 2006.01]
39/02 • Loose filtering material, e.g. loose fibres **[1, 2006.01]**
39/04 • • Organic material, e.g. cellulose, cotton **[1, 2006.01]**
39/06 • • Inorganic material, e.g. asbestos fibres, glass beads or fibres **[1, 2006.01]**
39/08 • Filter cloth, i.e. woven, knitted or interlaced material (metallic B01D 39/10) **[1, 2006.01]**
39/10 • Filter screens essentially made of metal **[1, 2006.01]**
39/12 • • of wire gauze; of knitted wire; of expanded metal **[1, 2006.01]**
39/14 • Other self-supporting filtering material **[1, 2006.01]**
39/16 • • of organic material, e.g. synthetic fibres **[1, 2006.01]**
39/18 • • • the material being cellulose or derivatives thereof **[1, 2006.01]**
39/20 • • of inorganic material, e.g. asbestos paper or metallic filtering material of non-woven wires **[1, 2006.01]**

41/00 Regeneration of the filtering material or filter elements outside the filter for liquid or gaseous fluids [1, 2006.01]
41/02 • of loose filtering material **[1, 2006.01]**
41/04 • of rigid self-supporting filtering material **[1, 2006.01]**

43/00 Separating particles from liquids, or liquids from solids, otherwise than by sedimentation or filtration (flotation processes B03D 1/00; drying solid materials or objects F26B) **[1, 2006.01]**

Separating dispersed particles from gases or vapours

45/00 Separating dispersed particles from gases or vapours by gravity, inertia, or centrifugal forces [1, 2006.01]
45/02 • by utilising gravity **[1, 2006.01]**
45/04 • by utilising inertia (B01D 45/12 takes precedence) **[1, 2006.01]**
45/06 • • by reversal of direction of flow **[1, 2006.01]**
45/08 • • by impingement against baffle separators **[1, 2006.01]**
45/10 • • • which are wetted **[1, 2006.01]**
45/12 • by centrifugal forces (centrifuges B04B; cyclones B04C) **[1, 2006.01]**
45/14 • • generated by rotating vanes, discs, drums or brushes **[1, 2006.01]**
45/16 • • generated by the winding course of the gas stream **[1, 2006.01]**
45/18 • Cleaning-out devices **[1, 2006.01]**

46/00 Filters or filtering processes specially modified for separating dispersed particles from gases or vapours (filtering elements B01D 24/00-B01D 35/00; filtering material B01D 39/00; their regeneration outside the filters B01D 41/00) **[1, 2006.01, 2022.01]**
46/02 • Particle separators, e.g. dust precipitators, having hollow filters made of flexible material **[1, 2006.01]**
46/04 • • Cleaning filters **[1, 2006.01]**
46/06 • • with means keeping the working surfaces flat **[1, 2006.01]**
46/08 • • • the working surfaces forming a star shape **[1, 2006.01]**
46/10 • Particle separators, e.g. dust precipitators, using filter plates, sheets or pads having plane surfaces **[1, 2006.01]**
46/12 • • in multiple arrangements **[1, 2006.01, 2022.01]**
46/121 • • • V-type arrangements **[2022.01]**

46/14 • • arranged in a star shape **[1, 2006.01]**
46/16 • • arranged on non-filtering conveyors **[1, 2006.01]**
46/18 • Particle separators, e.g. dust precipitators, using filtering belts **[1, 2006.01]**
46/20 • • the belts combined with drums **[1, 2006.01]**
46/22 • • the belts travelling during filtering **[1, 2006.01]**
46/24 • Particle separators, e.g. dust precipitators, using rigid hollow filter bodies **[1, 2006.01]**
46/26 • • rotatable **[1, 2006.01]**
46/28 • Particle separators, e.g. dust precipitators, using filter brushes **[1, 2006.01]**
46/30 • Particle separators, e.g. dust precipitators, using loose filtering material **[1, 2006.01]**
46/32 • • the material moving during filtering **[1, 2006.01]**
46/34 • • • not horizontally, e.g. using shoots **[1, 2006.01]**
46/36 • • • as a substantially horizontal layer, e.g. on rotary tables, drums or conveyor belts **[1, 2006.01]**
46/38 • • • as fluidised bed **[1, 2006.01]**
46/40 • Particle separators, e.g. dust precipitators, using edge filters, i.e. using contiguous impervious surfaces **[1, 2006.01]**
46/42 • Auxiliary equipment or operation thereof **[1, 2006.01]**
46/44 • • controlling filtration **[1, 2006.01]**
46/46 • • • automatic **[1, 2006.01]**
46/48 • • Removing dust other than cleaning filters **[1, 2006.01]**
46/50 • • Means for discharging electrostatic potential **[1, 2006.01]**
46/52 • Particle separators, e.g. dust precipitators, using filters embodying folded material **[1, 2006.01]**
46/54 • Particle separators, e.g. dust precipitators, using ultra-fine filter sheets or diaphragms **[1, 2006.01]**
46/56 • with multiple filtering elements, characterised by their mutual disposition (B01D 46/12 takes precedence) **[2022.01]**
46/58 • • connected in parallel **[2022.01]**
46/60 • • • arranged concentrically or coaxially **[2022.01]**
46/62 • • connected in series **[2022.01]**
46/64 • • • arranged concentrically or coaxially **[2022.01]**
46/66 • Regeneration of the filtering material or filter elements inside the filter (B01D 46/04, B01D 46/48 take precedence) **[2022.01]**
46/68 • • by means acting on the cake side involving movement with regard to the filter elements **[2022.01]**

Note(s) [2022.01]

Groups B01D 46/68-B01D 46/78 are only for dry processes.

46/681 • • • by scrapers, brushes or the like **[2022.01]**
46/682 • • • by nozzles **[2022.01]**
46/69 • • by means acting on the cake side without movement with respect to the filter elements, e.g. fixed nozzles **[2022.01]**
46/70 • • by acting counter-currently on the filtering surface, e.g. by flushing on the non-cake side of the filter **[2022.01]**
46/71 • • • with pressurised gas, e.g. pulsed air **[2022.01]**
46/72 • • • with backwash arms, shoes or nozzles **[2022.01]**
46/74 • • by forces created by movement of the filter element **[2022.01]**
46/76 • • • involving vibrations **[2022.01]**
46/762 • • • • involving sonic or ultrasonic waves **[2022.01]**
46/78 • • • involving centrifugal forces **[2022.01]**
46/79 • • by liquid process **[2022.01]**
46/80 • • Chemical processes for the removal of the retained particles, e.g. by burning **[2022.01]**
46/82 • • • with catalysts **[2022.01]**
46/84 • • • by heating only **[2022.01]**
46/86 • • Cleaning the filter surface by interrupting suction so that the filter cake falls by gravity **[2022.01]**
46/88 • Replacing filter elements **[2022.01]**
46/90 • Devices for taking out of action one or more units of multi-unit filters, e.g. for regeneration or maintenance **[2022.01]**

47/00 Separating dispersed particles from gases, air or vapours by liquid as separating agent (B01D 45/10 takes precedence; fractionating columns or parts thereof B01D 3/16) **[1, 2006.01]**

47/02 • by passing the gas or air or vapour over or through a liquid bath **[1, 2006.01]**
47/04 • by passing the gas or air or vapour through foam **[1, 2006.01]**
47/05 • by condensation of the separating agent **[3, 2006.01]**
47/06 • Spray cleaning **[1, 2006.01]**
47/08 • • with rotary nozzles **[1, 2006.01]**
47/10 • Venturi scrubbers **[1, 2006.01]**
47/12 • Washers with plural different washing sections (B01D 47/14 takes precedence) **[1, 3, 2006.01]**
47/14 • Packed scrubbers **[1, 3, 2006.01]**
47/16 • Apparatus having rotary means, other than rotatable nozzles, for atomising the cleaning liquid **[1, 2006.01]**
47/18 • • with horizontally-arranged shafts **[1, 2006.01]**

49/00 Separating dispersed particles from gases, air or vapours by other methods [1, 2006.01]

49/02 • by thermal repulsion **[1, 2006.01]**

50/00 Combinations of methods or devices for separating particles from gases or vapours [1, 2006.01, 2022.01]

Note(s) [2022.01]

Group B01D 50/10 takes precedence over groups B01D 50/20-B01D 50/60.

50/10 • Combinations of devices covered by groups B01D 45/00, B01D 46/00 and B01D 47/00 **[2022.01]**
50/20 • Combinations of devices covered by groups B01D 45/00 and B01D 46/00 **[2022.01]**
50/40 • Combinations of devices covered by groups B01D 45/00 and B01D 47/00 **[2022.01]**
50/60 • Combinations of devices covered by groups B01D 46/00 and B01D 47/00 **[2022.01]**

51/00 Auxiliary pretreatment of gases or vapours to be cleaned from dispersed particles [1, 6, 2006.01]

51/02 • Amassing the particles, e.g. by flocculation **[1, 2006.01]**
51/04 • • by seeding, e.g. by adding particles **[1, 2006.01]**
51/06 • • by varying the pressure of the gas or vapour **[1, 2006.01]**
51/08 • • • by sound or ultrasonics **[1, 2006.01]**
51/10 • Conditioning the gas to be cleaned **[1, 2006.01]**

53/00 **Separation of gases or vapours; Recovering vapours of volatile solvents from gases; Chemical or biological purification of waste gases, e.g. engine exhaust gases, smoke, fumes, flue gases or aerosols** (recovery of volatile solvents by condensation B01D 5/00; sublimation B01D 7/00; cold traps, cold baffles B01D 8/00; separation of difficult-to-condense gases or air by liquefaction F25J 3/00) **[1, 3, 5, 2006.01]**

Note(s)

Group B01D 53/34 takes precedence over groups B01D 53/02-B01D 53/32.

53/02 • by adsorption, e.g. preparative gas chromatography **[1, 2006.01]**
53/04 • • with stationary adsorbents **[1, 2006.01]**
53/047 • • • Pressure swing adsorption **[6, 2006.01]**
53/053 • • • • with storage or buffer vessel **[6, 2006.01]**
53/06 • • with moving adsorbents **[1, 2006.01]**
53/08 • • • according to the "moving bed" method **[1, 2006.01]**
53/10 • • • with dispersed adsorbents **[1, 2006.01]**
53/12 • • • • according to the "fluidised technique" **[1, 2006.01]**
53/14 • by absorption **[1, 2006.01]**
53/18 • • Absorbing units; Liquid distributors therefor (B01D 3/16, B01D 3/26, B01D 3/30 take precedence) **[1, 2006.01]**
53/22 • by diffusion **[1, 2006.01]**
53/24 • by centrifugal force (centrifuges B04B; cyclones B04C) **[1, 2006.01]**
53/26 • Drying gases or vapours **[1, 2006.01]**
53/28 • • Selection of materials for use as drying agents **[1, 2006.01]**
53/30 • Controlling by gas-analysis apparatus **[1, 2006.01]**
53/32 • by electrical effects other than those provided for in group B01D 61/00 **[1, 5, 2006.01]**
53/34 • Chemical or biological purification of waste gases **[1, 3, 6, 2006.01]**
53/38 • • Removing components of undefined structure **[6, 2006.01]**
53/40 • • • Acidic components (B01D 53/44 takes precedence) **[6, 2006.01]**
53/42 • • • Basic components (B01D 53/44 takes precedence) **[6, 2006.01]**
53/44 • • • Organic components **[6, 2006.01]**
53/46 • • Removing components of defined structure **[6, 2006.01]**
53/48 • • • Sulfur compounds **[6, 2006.01]**
53/50 • • • • Sulfur oxides (B01D 53/60 takes precedence) **[6, 2006.01]**
53/52 • • • • Hydrogen sulfide **[6, 2006.01]**
53/54 • • • Nitrogen compounds **[6, 2006.01]**
53/56 • • • • Nitrogen oxides (B01D 53/60 takes precedence) **[6, 2006.01]**
53/58 • • • • Ammonia **[6, 2006.01]**
53/60 • • • Simultaneously removing sulfur oxides and nitrogen oxides **[6, 2006.01]**
53/62 • • • Carbon oxides **[6, 2006.01]**
53/64 • • • Heavy metals or compounds thereof, e.g. mercury **[6, 2006.01]**
53/66 • • • Ozone **[6, 2006.01]**
53/68 • • • Halogens or halogen compounds **[6, 2006.01]**
53/70 • • • • Organic halogen compounds **[6, 2006.01]**
53/72 • • • Organic compounds not provided for in groups B01D 53/48-B01D 53/70, e.g. hydrocarbons **[6, 2006.01]**
53/73 • • After-treatment of removed components **[6, 2006.01]**
53/74 • • General processes for purification of waste gases; Apparatus or devices specially adapted therefor (B01D 53/92 takes precedence) **[6, 2006.01]**
53/75 • • • Multi-step processes **[6, 2006.01]**
53/76 • • • Gas phase processes, e.g. by using aerosols **[6, 2006.01]**
53/77 • • • Liquid phase processes **[6, 2006.01]**
53/78 • • • • with gas-liquid contact **[6, 2006.01]**
53/79 • • • • Injecting reactants **[6, 2006.01]**
53/80 • • • Semi-solid phase processes, i.e. by using slurries **[6, 2006.01]**
53/81 • • • Solid phase processes **[6, 2006.01]**
53/82 • • • • with stationary reactants **[6, 2006.01]**
53/83 • • • • with moving reactants **[6, 2006.01]**
53/84 • • • Biological processes **[6, 2006.01]**
53/85 • • • • with gas-solid contact **[6, 2006.01]**
53/86 • • • Catalytic processes **[6, 2006.01]**
53/88 • • • • Handling or mounting catalysts **[6, 2006.01]**
53/90 • • • • Injecting reactants **[6, 2006.01]**
53/92 • • of engine exhaust gases (exhaust apparatus having means for purifying or otherwise treating exhaust gases F01N 3/00) **[6, 2006.01]**
53/94 • • • by catalytic processes **[6, 2006.01]**
53/96 • • Regeneration, reactivation or recycling of reactants **[6, 2006.01]**

57/00 **Separation, other than separation of solids, not fully covered by a single other group or subclass, e.g. B03C [1, 2006.01]**

57/02 • by electrophoresis **[3, 5, 2006.01]**

59/00 **Separation of different isotopes of the same chemical element [1, 2006.01]**

59/02 • Separation by phase transition **[1, 2006.01]**
59/04 • • by distillation **[1, 2006.01]**
59/06 • • by fractional melting; by zone melting **[1, 2006.01]**
59/08 • • by fractional crystallisation, by precipitation, by zone freezing **[1, 2006.01]**
59/10 • Separation by diffusion **[1, 2006.01]**
59/12 • • by diffusion through barriers **[1, 2006.01]**
59/14 • • • Construction of the barrier **[1, 2006.01]**
59/16 • • by thermal diffusion **[1, 2006.01]**
59/18 • • by separation jets **[1, 2006.01]**
59/20 • Separation by centrifuging **[1, 2006.01]**
59/22 • Separation by extracting **[1, 2006.01]**
59/24 • • by solvent extraction **[1, 2006.01]**
59/26 • • by sorption, i.e. absorption, adsorption, persorption **[1, 2006.01]**
59/28 • Separation by chemical exchange **[1, 2006.01]**
59/30 • • by ion exchange **[1, 2006.01]**
59/32 • • by exchange between fluids **[1, 2006.01]**
59/33 • • • involving dual temperature exchange **[2, 2006.01]**
59/34 • Separation by photochemical methods **[1, 2006.01]**
59/36 • Separation by biological methods **[1, 2006.01]**
59/38 • Separation by electrochemical methods **[1, 2006.01]**
59/40 • • by electrolysis **[1, 2006.01]**
59/42 • • by electromigration; by electrophoresis **[1, 2006.01]**
59/44 • Separation by mass spectrography (particle spectrometers or separator tubes H01J 49/00) **[1, 2006.01]**

59/46 • • using only electrostatic fields **[1, 2006.01]**
59/48 • • using electrostatic and magnetic fields **[1, 2006.01]**
59/50 • Separation involving two or more processes covered by different groups selected from groups B01D 59/02, B01D 59/10, B01D 59/20, B01D 59/22, B01D 59/28, B01D 59/34, B01D 59/36, B01D 59/38, B01D 59/44 **[1, 2006.01]**

Processes of separation using semi-permeable membranes, e.g. dialysis, osmosis or ultrafiltration; Apparatus specially adapted therefor; Semi-permeable membranes or their production [5]

Note(s) [5]

In groups B01D 61/00-B01D 71/00, 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.

61/00 Processes of separation using semi-permeable membranes, e.g. dialysis, osmosis or ultrafiltration; Apparatus, accessories or auxiliary operations specially adapted therefor (separation of gases or vapours by diffusion B01D 53/22) **[5, 2006.01]**

61/02 • Reverse osmosis; Hyperfiltration **[5, 2006.01]**
61/04 • • Feed pretreatment **[5, 2006.01]**
61/06 • • Energy recovery **[5, 2006.01]**
61/08 • • Apparatus therefor **[5, 2006.01]**
61/10 • • Accessories; Auxiliary operations **[5, 2006.01]**
61/12 • • Controlling or regulating **[5, 2006.01]**
61/14 • Ultrafiltration; Microfiltration **[5, 2006.01]**
61/16 • • Feed pretreatment **[5, 2006.01]**
61/18 • • Apparatus therefor **[5, 2006.01]**
61/20 • • Accessories; Auxiliary operations **[5, 2006.01]**
61/22 • • Controlling or regulating **[5, 2006.01]**
61/24 • Dialysis **[5, 2006.01]**
61/26 • • Dialysate solution flow, e.g. preparation, regeneration **[5, 2006.01]**
61/28 • • Apparatus therefor **[5, 2006.01]**
61/30 • • Accessories; Auxiliary operation **[5, 2006.01]**
61/32 • • Controlling or regulating **[5, 2006.01]**
61/34 • • • Measuring ultrafiltrate during dialysis **[5, 2006.01]**
61/36 • Pervaporation; Membrane distillation; Liquid permeation **[5, 2006.01]**
61/38 • Liquid-membrane separation **[5, 2006.01]**
61/40 • • using emulsion-type membranes **[5, 2006.01]**
61/42 • Electrodialysis; Electro-osmosis **[5, 2006.01]**
61/44 • • Ion-selective electrodialysis **[5, 2006.01]**
61/46 • • • Apparatus therefor **[5, 2006.01]**
61/48 • • • • having one or more compartments filled with ion-exchange material **[5, 2006.01]**
61/50 • • • • Stacks of the plate-and-frame type **[5, 2006.01]**
61/52 • • • Accessories; Auxiliary operation **[5, 2006.01]**
61/54 • • • Controlling or regulating **[5, 2006.01]**
61/56 • • Electro-osmotic dewatering **[5, 2006.01]**
61/58 • Multistep processes **[5, 2006.01]**

63/00 Apparatus in general for separation processes using semi-permeable membranes [5, 2006.01]

63/02 • Hollow fibre modules **[5, 2006.01]**
63/04 • • comprising multiple hollow fibre assemblies **[5, 2006.01]**
63/06 • Tubular membrane modules **[5, 2006.01]**
63/08 • Flat membrane modules **[5, 2006.01]**
63/10 • Spiral-wound membrane modules **[5, 2006.01]**
63/12 • • comprising multiple spiral-wound assemblies **[5, 2006.01]**
63/14 • Pleat-type membrane modules **[5, 2006.01]**
63/16 • Rotary, reciprocated or vibrated modules **[5, 2006.01]**

65/00 Accessories or auxiliary operations, in general, for separation processes or apparatus using semi-permeable membranes [5, 2006.01]

65/02 • Membrane cleaning or sterilisation **[5, 2006.01]**
65/04 • • with movable bodies, e.g. foam balls **[5, 2006.01]**
65/06 • • with special washing compositions **[5, 2006.01]**
65/08 • Prevention of membrane fouling or of concentration polarisation **[5, 2006.01]**
65/10 • Testing of membranes or membrane apparatus; Detecting or repairing leaks **[5, 2006.01]**

67/00 Processes specially adapted for manufacturing semi-permeable membranes for separation processes or apparatus [5, 2006.01]

69/00 Semi-permeable membranes for separation processes or apparatus characterised by their form, structure or properties; Manufacturing processes specially adapted therefor [5, 2006.01]

Note(s) [5]

1. In this group, the following term is used with the meaning indicated:
   - "properties" covers those of a mechanical, physical or chemical nature.
2. Manufacturing processes, if considered of interest, are also classified in group B01D 67/00.

69/02 • characterised by their properties **[5, 2006.01]**
69/04 • Tubular membranes **[5, 2006.01]**
69/06 • Flat membranes **[5, 2006.01]**
69/08 • Hollow fibre membranes (manufacture of hollow fibres D01D 5/24, D01F 1/08) **[5, 2006.01]**
69/10 • Supported membranes; Membrane supports **[5, 2006.01]**
69/12 • Composite membranes; Ultra-thin membranes **[5, 2006.01]**
69/14 • Dynamic membranes **[5, 2006.01]**

71/00 Semi-permeable membranes for separation processes or apparatus characterised by the material; Manufacturing processes specially adapted therefor [5, 2006.01]

Note(s) [5]

1. In this group, if the material is a composition it is classified according to the constituent present in highest proportion. This constituent is classified according to the last place rule, see Note before group B01D 61/00. If there is more than one constituent present in equal highest proportions, then each of these constituents is classified according to the last place rule.
2. Manufacturing processes, if considered of interest, are also classified in group B01D 67/00.

71/02 • Inorganic material **[5, 2006.01]**
71/04 • • Glass **[5, 2006.01]**
71/06 • Organic material **[5, 2006.01]**
71/08 • • Polysaccharides **[5, 2006.01]**
71/10 • • • Cellulose; Modified cellulose **[5, 2006.01]**

71/12 • • • Cellulose derivatives **[5, 2006.01]**
71/14 • • • • Esters of organic acids **[5, 2006.01]**
71/16 • • • • • Cellulose acetate **[5, 2006.01]**
71/18 • • • • • Mixed esters, e.g. cellulose acetate-butyrate **[5, 2006.01]**
71/20 • • • • Esters of inorganic acids, e.g. cellulose nitrate **[5, 2006.01]**
71/22 • • • • Cellulose ethers **[5, 2006.01]**
71/24 • • Rubbers **[5, 2006.01]**

Note(s) [5]

In this group the following term is used with the meaning indicated:
- "rubber" covers:
  a. natural or conjugated diene rubber;
  b. rubber in general (for specific rubber, see the group provided for such macromolecular compound).

71/26 • • Polyalkenes **[5, 2006.01]**
71/28 • • Polymers of vinyl aromatic compounds **[5, 2006.01]**
71/30 • • Polyalkenyl halides **[5, 2006.01]**
71/32 • • • containing fluorine atoms **[5, 2006.01]**
71/34 • • • • Polyvinylidene fluoride **[5, 2006.01]**
71/36 • • • • Polytetrafluoroethene **[5, 2006.01]**
71/38 • • Polyalkenylalcohols; Polyalkenylesters; Polyalkenylethers; Polyalkenylaldehydes; Polyalkenylketones; Polyalkenylacetals; Polyalkenylketals **[5, 2006.01]**
71/40 • • Polymers of unsaturated acids or derivatives thereof, e.g. salts, amides, imides, nitriles, anhydrides, esters **[5, 2006.01]**
71/42 • • • Polymers of nitriles, e.g. polyacrylonitrile **[5, 2006.01]**
71/44 • • Polymers obtained by reactions only involving carbon-to-carbon unsaturated bonds, not provided for in a single one of groups B01D 71/26-B01D 71/42 **[5, 2006.01]**
71/46 • • Epoxy resins **[5, 2006.01]**
71/48 • • Polyesters **[5, 2006.01]**
71/50 • • Polycarbonates **[5, 2006.01]**
71/52 • • Polyethers **[5, 2006.01]**
71/54 • • Polyureas; Polyurethanes **[5, 2006.01]**
71/56 • • Polyamides, e.g. polyester-amides **[5, 2006.01]**
71/58 • • Other polymers having nitrogen in the main chain, with or without oxygen or carbon only **[5, 2006.01]**
71/60 • • • Polyamines **[5, 2006.01]**
71/62 • • • Polycondensates having nitrogen-containing heterocyclic rings in the main chain **[5, 2006.01]**
71/64 • • • • Polyimides; Polyamide-imides; Polyester-imides; Polyamide acids or similar polyimide precursors **[5, 2006.01]**
71/66 • • Polymers having sulfur in the main chain, with or without nitrogen, oxygen or carbon only **[5, 2006.01]**
71/68 • • • Polysulfones; Polyethersulfones **[5, 2006.01]**
71/70 • • Polymers having silicon in the main chain, with or without sulfur, nitrogen, oxygen or carbon only **[5, 2006.01]**
71/72 • • Macromolecular compounds obtained otherwise than by reactions only involving carbon-to-carbon unsaturated bonds, not provided for in a single one of groups B01D 71/46-B01D 71/70 **[5, 2006.01]**
71/74 • • Natural macromolecular material or derivatives thereof (B01D 71/08, B01D 71/24 take precedence) **[5, 2006.01]**
71/76 • • Macromolecular material not specifically provided for in a single one of groups B01D 71/08-B01D 71/74 (rubbers in general B01D 71/24) **[5, 2006.01]**
71/78 • • • Graft polymers **[5, 2006.01]**
71/80 • • • Block polymers **[5, 2006.01]**
71/82 • • • characterised by the presence of specified groups, e.g. introduced by chemical after-treatment **[5, 2006.01]**

B01F MIXING, e.g. DISSOLVING, EMULSIFYING OR DISPERSING (mixing paints B44D 3/06)

Note(s) [2]

1. This subclass covers:
   - agitation or homogenisation of products formed by a combination of two or more components with the purpose of obtaining a homogeneous composition or homogeneous conditions in the mass of material;
   - stirring of a single material with the purpose of obtaining homogeneous conditions in the mass of material;
   - mixing, agitation and homogenisation of materials, irrespective of the application in which it is produced, whenever the device or the method are directed to achieve the desired effect.
2. In this subclass, the following term is used with the meaning indicated:
   - "mixing" also covers stirring of a single material.

Subclass index

DISSOLVING....21/00
MIXING, DISPERSING, EMULSIFYING
Processes....23/00
Apparatus
flow mixers....25/00
with rotary action....27/00, 29/00
other mixers....31/00, 33/00
accessories....35/00

21/00 **Dissolving** (separating by dissolving B01D; dissolving to effect cooling F25D 5/00) **[2022.01]**

21/10 • using driven stirrers **[2022.01]**

21/20 • using flow mixing **[2022.01]**

23/00 **Mixing according to the phases to be mixed, e.g. dispersing or emulsifying [2022.01]**

Note(s) [2022.01]

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

- "gases" covers also vapours.

23/10 • Mixing gases with gases **[2022.01]**

23/20 • Mixing gases with liquids **[2022.01]**

23/21 • • by introducing liquids into gaseous media **[2022.01]**

23/213 • • • by spraying or atomising of the liquids **[2022.01]**

23/23 • • by introducing gases into liquid media, e.g. for producing aerated liquids **[2022.01]**

23/231 • • • by bubbling (mixers with gas or liquid agitation, e.g. with air supply tubes B01F 33/40) **[2022.01]**

23/232 • • • using flow-mixing means for introducing the gases, e.g. baffles **[2022.01]**

23/2326 • • • • adding the flowing main component by suction means, e.g. using an ejector **[2022.01]**

23/233 • • • using driven stirrers with completely immersed stirring elements **[2022.01]**

23/234 • • • Surface aerating **[2022.01]**

23/235 • • • for making foam **[2022.01]**

23/236 • • • specially adapted for aerating or carbonating beverages **[2022.01]**

23/2361 • • • • within small containers, e.g. within bottles **[2022.01]**

23/237 • • • characterised by the physical or chemical properties of gases or vapours introduced in the liquid media **[2022.01]**

23/2373 • • • • for obtaining fine bubbles, i.e. bubbles with a size below 100 µm **[2022.01]**

23/2375 • • • • • for obtaining bubbles with a size below 1 µm **[2022.01]**

23/30 • Mixing gases with solids **[2022.01]**

23/40 • Mixing liquids with liquids; Emulsifying **[2022.01]**

23/41 • • Emulsifying **[2022.01]**

23/411 • • • using electrical or magnetic fields, heat or vibrations **[2022.01]**

23/43 • • using driven stirrers **[2022.01]**

23/45 • • using flow mixing **[2022.01]**

23/451 • • • by injecting one liquid into another **[2022.01]**

23/454 • • • by injecting a mixture of liquid and gas **[2022.01]**

23/47 • • involving high-viscosity liquids, e.g. asphalt **[2022.01]**

23/50 • Mixing liquids with solids (displacing one liquid by another in dispersions of solids in liquids B01D 12/00) **[2022.01]**

23/53 • • using driven stirrers **[2022.01]**

23/57 • • Mixing high-viscosity liquids with solids **[2022.01]**

23/60 • Mixing solids with solids **[2022.01]**

23/62 • • using a receptacle with a bottom discharge with oscillating or vibrating opening and closing elements; using a receptacle with a bottom discharge with elements fitted on moving chains **[2022.01]**

23/64 • • using rotatable mixing elements at the lower end of discharge hoppers **[2022.01]**

23/70 • Pre-treatment of the materials to be mixed **[2022.01]**

23/80 • After-treatment of the mixture **[2022.01]**

Mixers [2022.01]

25/00 **Flow mixers; Mixers for falling materials, e.g. solid particles** (centrifugal mixers B04) **[2022.01]**

25/10 • Mixing by creating a vortex flow, e.g. by tangential introduction of flow components **[2022.01]**

25/20 • Jet mixers, i.e. mixers using high-speed fluid streams (using jets to create vortex flow B01F 25/10) **[2022.01]**

25/21 • • with submerged injectors, e.g. nozzles, for injecting high-pressure jets into a large volume or into mixing chambers **[2022.01]**

25/23 • • Mixing by intersecting jets **[2022.01]**

25/25 • • Mixing by jets impinging against collision plates **[2022.01]**

25/27 • • Mixing by jetting components into a conduit for agitating its contents **[2022.01]**

25/30 • Injector mixers (mixing by creating vortex flow B01F 25/10) **[2022.01]**

25/31 • • in conduits or tubes through which the main component flows **[2022.01]**

25/312 • • • with Venturi elements; Details thereof **[2022.01]**

25/313 • • • wherein additional components are introduced in the centre of the conduit **[2022.01]**

25/314 • • • wherein additional components are introduced at the circumference of the conduit **[2022.01]**

25/315 • • • wherein a difference of pressure at different points of the conduit causes introduction of the additional component into the main component (B01F 25/316 takes precedence) **[2022.01]**

25/316 • • • with containers for additional components fixed to the conduit **[2022.01]**

25/32 • • wherein the additional components are added in a by-pass of the main flow **[2022.01]**

25/40 • Static mixers (colloid-mills B02C; mixing valves F16K 11/00) **[2022.01]**

25/41 • • Mixers of the fractal type **[2022.01]**

25/42 • • in which the mixing is affected by moving the components jointly in changing directions, e.g. in tubes provided with baffles or obstructions **[2022.01]**

25/421 • • • by moving the components in a convoluted or labyrinthine path (B01F 25/433 takes precedence) **[2022.01]**

25/422 • • • • between stacked plates, e.g. grooved or perforated plates **[2022.01]**

25/43 • • • Mixing tubes, e.g. wherein the material is moved in a radial or partly reversed direction **[2022.01]**

25/431 • • • • Straight mixing tubes with baffles or obstructions that do not cause substantial pressure drop; Baffles therefor **[2022.01]**

25/4314 • • • • • with helical baffles **[2022.01]**

25/432 • • • • with means for dividing the material flow into separate sub-flows and for repositioning and recombining these sub-flows; Cross-mixing, e.g. conducting the outer layer of the material nearer to the axis of the tube or vice-versa **[2022.01]**

25/433 • • • • Mixing tubes wherein the shape of the tube influences the mixing, e.g. mixing tubes with varying cross-section or provided with inwardly extending profiles **[2022.01]**

25/434 • • • • Mixing tubes comprising cylindrical or conical inserts provided with grooves or protrusions **[2022.01]**

25/435 • • • • Mixing tubes composed of concentric tubular members **[2022.01]**

25/44 • • Mixers in which the components are pressed through slits **[2022.01]**

25/441 • • • characterised by the configuration of the surfaces forming the slits **[2022.01]**

25/442 • • • characterised by the relative position of the surfaces during operation **[2022.01]**

25/45 • • Mixers in which the materials to be mixed are pressed together through orifices or interstitial spaces, e.g. between beads (B01F 25/44 takes precedence) **[2022.01]**

25/451 • • • characterised by means for moving the materials to be mixed or the mixture **[2022.01]**

25/452 • • • characterised by elements provided with orifices or interstitial spaces **[2022.01]**

25/46 • • Homogenising or emulsifying nozzles **[2022.01]**

25/50 • Circulation mixers, e.g. wherein at least part of the mixture is discharged from and reintroduced into a receptacle **[2022.01]**

25/51 • • in which the mixture is circulated through a set of tubes, e.g. with gradual introduction of a component into the circulating flow **[2022.01]**

25/52 • • with a rotary stirrer in the recirculation tube **[2022.01]**

25/53 • • in which the mixture is discharged from and reintroduced into a receptacle through a recirculation tube, into which an additional component is introduced **[2022.01]**

25/54 • • provided with a pump inside the receptacle to recirculate the material within the receptacle **[2022.01]**

25/60 • Pump mixers, i.e. mixing within a pump **[2022.01]**

25/62 • • of the gear type **[2022.01]**

25/64 • • of the centrifugal-pump type, i.e. turbo-mixers **[2022.01]**

25/70 • Spray-mixers, e.g. for mixing intersecting sheets of material **[2022.01]**

25/72 • • with nozzles **[2022.01]**

25/721 • • • for spraying a fluid on falling particles or on a liquid curtain **[2022.01]**

25/74 • • with rotating parts, e.g. discs **[2022.01]**

25/80 • Falling particle mixers, e.g. with repeated agitation along a vertical axis **[2022.01]**

25/82 • • uniting flows of material taken from different parts of a receptacle or from a set of different receptacles **[2022.01]**

25/83 • • with receptacles provided with fixed guiding elements therein, e.g. baffles; Cross-mixers comprising crossing channels for guiding the falling particles **[2022.01]**

25/85 • • wherein the particles fall onto a film that flows along the inner wall of a mixer **[2022.01]**

25/90 • • with moving or vibrating means, e.g. stirrers, for enhancing the mixing **[2022.01]**

27/00 Mixers with rotary stirring devices in fixed receptacles (magnetic mixers B01F 33/45)**; Kneaders [2022.01]**

27/05 • Stirrers **[2022.01]**

27/051 • • characterised by their elements, materials or mechanical properties **[2022.01]**

27/052 • • • Stirrers with replaceable wearing elements; Wearing elements therefor **[2022.01]**

27/053 • • • characterised by their materials **[2022.01]**

27/054 • • • Deformable stirrers, e.g. deformed by a centrifugal force applied during operation **[2022.01]**

27/07 • • characterised by their mounting on the shaft **[2022.01]**

27/072 • • • characterised by the disposition of the stirrers with respect to the rotating axis **[2022.01]**

27/09 • • characterised by the mounting of the stirrers with respect to the receptacle **[2022.01]**

27/091 • • • with elements co-operating with receptacle wall or bottom, e.g. for scraping the receptacle wall **[2022.01]**

27/093 • • • eccentrically arranged **[2022.01]**

27/11 • • characterised by the configuration of the stirrers **[2022.01]**

27/111 • • • Centrifugal stirrers, i.e. stirrers with radial outlets; Stirrers of the turbine type, e.g. with means to guide the flow **[2022.01]**

27/1111 • • • • with a flat disc or with a disc-like element equipped with blades, e.g. Rushton turbine **[2022.01]**

27/112 • • • with arms, paddles, vanes or blades **[2022.01]**

27/1121 • • • • pin-shaped **[2022.01]**

27/1122 • • • • anchor-shaped **[2022.01]**

27/1123 • • • • sickle-shaped, i.e. curved in at least one direction **[2022.01]**

27/1124 • • • • rake-shaped or grid-shaped **[2022.01]**

27/1125 • • • • with vanes or blades extending parallel or oblique to the stirrer axis **[2022.01]**

27/1126 • • • • the stirrer being a bent rod supported at one end only **[2022.01]**

27/1127 • • • • spoon-shaped **[2022.01]**

27/113 • • • Propeller-shaped stirrers for producing an axial flow, e.g. shaped like a ship or aircraft propeller **[2022.01]**

27/1131 • • • • with holes in the propeller blade surface **[2022.01]**

27/1132 • • • • with guiding tubes or tubular segments fixed to and surrounding the tips of the propeller blades, e.g. for supplementary mixing **[2022.01]**

27/114 • • • Helically shaped stirrers, i.e. stirrers comprising a helically shaped band or helically shaped band sections **[2022.01]**

27/1142 • • • • of the corkscrew type **[2022.01]**

27/1143 • • • • screw-shaped, e.g. worms **[2022.01]**

27/1144 • • • • with a plurality of blades following a helical path on a shaft or a blade support **[2022.01]**

27/1145 • • • • ribbon shaped with an open space between the helical ribbon flight and the rotating axis **[2022.01]**

27/115 • • • comprising discs or disc-like elements essentially perpendicular to the stirrer shaft axis **[2022.01]**

27/1151 • • • • with holes on the surface **[2022.01]**

27/1152 • • • • with separate elements other than discs fixed on the discs, e.g. vanes fixed on the discs **[2022.01]**

27/116 • • • Stirrers shaped as cylinders, balls or rollers **[2022.01]**

27/117 • • • Stirrers provided with conical-shaped elements, e.g. funnel-shaped **[2022.01]**

27/118 • • • Stirrers in the form of brushes, sieves, grids, chains or springs **[2022.01]**
27/119 • • • Stirrers with rigid wires or flexible rods **[2022.01]**
27/13 • • • Openwork frame or cage stirrers not provided for in other groups of this subclass **[2022.01]**
27/15 • • • Stirrers with tubes for guiding the material **[2022.01]**
27/17 • • • Stirrers with additional elements mounted on the stirrer, for purposes other than mixing **[2022.01]**
27/171 • • • • for disintegrating, e.g. for milling **[2022.01]**
27/172 • • • • for cutting, e.g. with knives **[2022.01]**
27/19 • • • Stirrers with two or more mixing elements mounted in sequence on the same axis **[2022.01]**
27/191 • • • • with similar elements **[2022.01]**
27/192 • • • • with dissimilar elements **[2022.01]**
27/21 • characterised by their rotating shafts **[2022.01]**
27/211 • • characterised by the material of the shaft **[2022.01]**
27/2111 • • • Flexible shafts **[2022.01]**
27/2121 • • composed of interconnected parts **[2022.01]**
27/2122 • • Hollow shafts **[2022.01]**
27/2123 • • Shafts with both stirring means and feeding or discharging means **[2022.01]**
27/2124 • • Shafts with adjustable length, e.g. telescopic shafts **[2022.01]**
27/213 • • characterised by the connection with the drive **[2022.01]**
27/23 • characterised by the orientation or disposition of the rotor axis **[2022.01]**
27/231 • • with a variable orientation during mixing operation, e.g. with tiltable rotor axis **[2022.01]**
27/232 • • with two or more rotation axes **[2022.01]**
27/2322 • • • with parallel axes **[2022.01]**
27/2323 • • • with perpendicular axes **[2022.01]**
27/25 • Mixers with both stirrer and drive unit submerged in the material being mixed **[2022.01]**
27/27 • Mixers with stator-rotor systems, e.g. with intermeshing teeth or cylinders or having orifices (the stirrers having a central axial inflow and a substantially radial outflow B01F 27/81) **[2022.01]**
27/271 • • with means for moving the materials to be mixed radially between the surfaces of the rotor and the stator **[2022.01]**
27/272 • • with means for moving the materials to be mixed axially between the surfaces of the rotor and the stator, e.g. the stator rotor system formed by conical or cylindrical surfaces **[2022.01]**
27/40 • Mixers with rotor-rotor system, e.g. with intermeshing teeth **[2022.01]**
27/41 • • with the mutually rotating surfaces facing each other **[2022.01]**
27/42 • • with rotating surfaces next to each other, i.e. on substantially parallel axes **[2022.01]**
27/50 • Pipe mixers, i.e. mixers wherein the materials to be mixed flow continuously through pipes, e.g. column mixers **[2022.01]**
27/55 • with stirrers driven by the moving material **[2022.01]**
27/60 • with stirrers rotating about a horizontal or inclined axis **[2022.01]**
27/61 • • about an inclined axis **[2022.01]**
27/63 • • co-operating with deflectors or baffles fixed to the receptacle **[2022.01]**
27/65 • • with buckets **[2022.01]**
27/70 • • with paddles, blades or arms **[2022.01]**
27/701 • • • comprising two or more shafts, e.g. in consecutive mixing chambers **[2022.01]**
27/702 • • • • with intermeshing paddles **[2022.01]**
27/703 • • • • with stirrers rotating at different speeds **[2022.01]**
27/704 • • • • with stirrers facing each other, i.e. supported by opposite walls of the receptacle **[2022.01]**
27/705 • • • • with stirrers rotating in opposite directions about the same axis, e.g. with a first stirrer surrounded by a tube inside a second stirrer **[2022.01]**
27/706 • • • • with all the shafts in the same receptacle (B01F 27/702-B01F 27/705 take precedence) **[2022.01]**
27/707 • • • the paddles co-operating, e.g. intermeshing, with elements on the receptacle wall **[2022.01]**
27/708 • • • characterised by the shape of the stirrer as a whole, i.e. of Z- or S-shape **[2022.01]**
27/71 • • with propellers **[2022.01]**
27/72 • • with helices or sections of helices **[2022.01]**
27/721 • • • with two or more helices in the same receptacle **[2022.01]**
27/722 • • • • the helices closely surrounded by a casing **[2022.01]**
27/723 • • • • the helices intermeshing to knead the mixture **[2022.01]**
27/724 • • • with a single helix closely surrounded by a casing **[2022.01]**
27/726 • • • with two helices with opposite pitch on the same shaft; with two helices on the same axis, driven in opposite directions or at different speeds **[2022.01]**
27/73 • • with rotary discs **[2022.01]**
27/74 • • with rotary cylinders **[2022.01]**
27/75 • • with stirrers having planetary motion, i.e. rotating about their own axis and about a sun axis **[2022.01]**
27/80 • with stirrers rotating about a substantially vertical axis **[2022.01]**
27/805 • • wherein the stirrers or the receptacles are moved in order to bring them into operative position; Means for fixing the receptacle **[2022.01]**
27/806 • • • with vertical displacement of the stirrer, e.g. in combination with means for pivoting the stirrer about a vertical axis in order to co-operate with different receptacles **[2022.01]**
27/807 • • • with the stirrer-head pivoting about a horizontal axis to bring it in and out of operative position, e.g. with receptacles pivoting about a horizontal axis for emptying **[2022.01]**
27/808 • • with stirrers driven from the bottom of the receptacle **[2022.01]**
27/81 • • the stirrers having central axial inflow and substantially radial outflow **[2022.01]**
27/82 • • Pan-type mixers, i.e. mixers in which the stirring elements move along the bottom of a pan-shaped receptacle (with stirring elements moving along the wall or bottom of the receptacle B01F 27/091) **[2022.01]**
27/83 • • the stirrers being additionally moved radially, or oscillating about an axis perpendicular to the stirrer axis **[2022.01]**
27/84 • • with two or more stirrers rotating at different speeds or in opposite directions about the same axis **[2022.01]**

27/85 • • with two or more stirrers on separate shafts **[2022.01]**
27/86 • • co-operating with deflectors or baffles fixed to the receptacle **[2022.01]**
27/87 • • the receptacle being divided into superimposed compartments **[2022.01]**
27/88 • • with a separate receptacle-stirrer unit that is adapted to be coupled to a drive mechanism **[2022.01]**
27/90 • • with paddles or arms **[2022.01]**
27/902 • • • cooperating with intermeshing elements fixed on the receptacle walls **[2022.01]**
27/906 • • • with fixed axis **[2022.01]**
27/91 • • with propellers **[2022.01]**
27/92 • • with helices or screws **[2022.01]**
27/921 • • • with helices centrally mounted in the receptacle **[2022.01]**
27/9212 • • • • with conical helices **[2022.01]**
27/922 • • • with two or more helices, e.g. with intermeshing helices **[2022.01]**
27/93 • • with rotary discs **[2022.01]**
27/94 • • with rotary cylinders or cones **[2022.01]**
27/95 • • with stirrers having planetary motion, i.e. rotating about their own axis and about a sun axis **[2022.01]**
27/952 • • • the stirrers being cylinders with their circumference in contact with the bottom of the receptacle and rotating about an axis at an angle to the sun axis, e.g. mixers of the Muller type **[2022.01]**
27/96 • • with openwork frames or cages **[2022.01]**

29/00 Mixers with rotating receptacles [2022.01]

29/10 • with receptacles rotated about two different axes, e.g. receptacles having planetary motion **[2022.01]**
29/15 • Use of centrifuges for mixing **[2022.01]**
29/20 • with receptacles rotating about an axis at an angle to their longitudinal axis (B01F 29/62 takes precedence) **[2022.01]**
29/25 • with material flowing continuously through the receptacles from inlet to discharge **[2022.01]**
29/30 • Mixing the contents of individual packages or containers, e.g. by rotating tins or bottles **[2022.01]**
29/31 • • the containers being supported by driving means, e.g. by rotating rollers **[2022.01]**
29/32 • • Containers specially adapted for coupling to rotating frames or the like; Coupling means therefor **[2022.01]**
29/321 • • • of test-tubes or the like **[2022.01]**
29/322 • • • of two or more containers supported for simultaneous mixing, e.g. for bottles in crates **[2022.01]**
29/33 • • by imparting a combination of movements to two or more containers **[2022.01]**
29/34 • • Constructional details of holders for the individual packages or containers **[2022.01]**
29/60 • rotating about a horizontal or inclined axis, e.g. drum mixers **[2022.01]**
29/62 • • without bars, i.e. without mixing elements; characterised by the shape or cross section of the receptacle, e.g. of Y-, Z-, S- or X- shape; with cylindrical receptacles rotating about an axis at an angle to their longitudinal axis **[2022.01]**
29/63 • • with fixed bars, i.e. stationary, or fixed on the receptacle **[2022.01]**
29/64 • • with stirring devices moving in relation to the receptacle, e.g. rotating **[2022.01]**
29/80 • rotating about a substantially vertical axis **[2022.01]**
29/81 • • with stationary mixing elements **[2022.01]**
29/83 • • with rotary paddles or arms, e.g. movable out of the receptacle **[2022.01]**
29/84 • • with propellers **[2022.01]**
29/85 • • with helices, e.g. rotating about an inclined axis **[2022.01]**
29/86 • • with rotary discs **[2022.01]**
29/87 • • with rotary cylinders **[2022.01]**
29/90 • with stirrers having planetary motion **[2022.01]**

31/00 Mixers with shaking, oscillating, or vibrating mechanisms [2022.01]

31/10 • with a mixing receptacle rotating alternately in opposite directions **[2022.01]**
31/20 • Mixing the contents of independent containers, e.g. test tubes **[2022.01]**
31/22 • • with supporting means moving in a horizontal plane, e.g. describing an orbital path for moving the containers about an axis which intersects the receptacle axis at an angle **[2022.01]**
31/23 • • by pivoting the containers about an axis **[2022.01]**
31/24 • • the containers being submitted to a rectilinear movement **[2022.01]**
31/25 • • the containers being submitted to a combination of movements other than within a horizontal plane, e.g. rectilinear and pivoting movement (with a receptacle submitted to a combination of movements, i.e. at least one movement being vibratory or oscillatory B01F 31/50) **[2022.01]**
31/29 • Mixing by periodically deforming flexible tubular members through which the material is flowing **[2022.01]**
31/30 • comprising a receptacle to only a part of which the shaking, oscillating, or vibrating movement is imparted **[2022.01]**
31/31 • • using receptacles with deformable parts, e.g. membranes, to which a motion is imparted **[2022.01]**
31/40 • with an axially oscillating rotary stirrer **[2022.01]**
31/42 • with pendulum stirrers, i.e. with stirrers suspended so as to oscillate about fixed points or axes **[2022.01]**
31/44 • with stirrers performing an oscillatory, vibratory or shaking movement (B01F 31/40, B01F 31/42 take precedence) **[2022.01]**
31/441 • • performing a rectilinear reciprocating movement **[2022.01]**
31/445 • • performing an oscillatory movement about an axis **[2022.01]**
31/46 • with an annular vibrating trough **[2022.01]**
31/50 • with a receptacle submitted to a combination of movements, i.e. at least one vibratory or oscillatory movement **[2022.01]**
31/55 • the materials to be mixed being contained in a flexible bag submitted to periodical deformation **[2022.01]**
31/60 • with a vibrating receptacle (B01F 31/10, B01F 31/20, B01F 31/50 take precedence) **[2022.01]**
31/65 • the materials to be mixed being directly submitted to a pulsating movement, e.g. by means of an oscillating piston or air column **[2022.01]**
31/80 • Mixing by means of high-frequency vibrations above one kHz, e.g. ultrasonic vibrations **[2022.01]**
31/81 • • by vibrations generated inside a mixing device not coming from an external drive, e.g. by the flow of material causing a knife to vibrate or by vibrating nozzles **[2022.01]**

31/85 • • with a vibrating element inside the receptacle **[2022.01]**

31/86 • • with vibration of the receptacle or part of it **[2022.01]**

31/87 • • transmitting the vibratory energy by means of a fluid, e.g. by means of air shock waves **[2022.01]**

33/00 Other mixers; Mixing plants; Combinations of mixers [2022.01]

33/05 • Mixers using radiation, e.g. magnetic fields or microwaves to mix the material (B01F 33/3031, B01F 33/3032 take precedence) **[2022.01]**

33/12 • Mixers in which the mixing of the components is achieved by natural convection **[2022.01]**

33/25 • Mixers with loose mixing elements, e.g. loose balls in a receptacle **[2022.01]**

33/30 • Micromixers **[2022.01]**

33/301 • • using specific means for arranging the streams to be mixed, e.g. channel geometries or dispositions **[2022.01]**

33/3011 • • • using a sheathing stream of a fluid surrounding a central stream of a different fluid, e.g. for reducing the cross-section of the central stream or to produce droplets from the central stream **[2022.01]**

33/3012 • • • Interdigital streams, e.g. lamellae **[2022.01]**

33/302 • • the materials to be mixed flowing in the form of droplets **[2022.01]**

33/3031 • • using electro-hydrodynamic [EHD] or electro-kinetic [EKI] phenomena to mix or move the fluids **[2022.01]**

33/3032 • • using magneto-hydrodynamic [MHD] phenomena to mix or move the fluids **[2022.01]**

33/3033 • • using heat to mix or move the fluids **[2022.01]**

33/3039 • • with mixing achieved by diffusion between layers **[2022.01]**

33/35 • Mixing after turning the mixing vessel upside down **[2022.01]**

33/40 • Mixers using gas or liquid agitation, e.g. with air supply tubes **[2022.01]**

33/45 • Magnetic mixers; Mixers with magnetically driven stirrers **[2022.01]**

33/451 • • wherein the mixture is directly exposed to an electromagnetic field without use of a stirrer, e.g. for material comprising ferromagnetic particles or for molten metal **[2022.01]**

33/452 • • using independent floating stirring elements **[2022.01]**

33/453 • • using supported or suspended stirring elements **[2022.01]**

33/50 • Movable or transportable mixing devices or plants **[2022.01]**

33/501 • • Movable mixing devices, i.e. readily shifted or displaced from one place to another, e.g. portable during use **[2022.01]**

33/502 • • Vehicle-mounted mixing devices **[2022.01]**

33/503 • • Floating mixing devices **[2022.01]**

33/70 • Mixers specially adapted for working at sub- or super-atmospheric pressure, e.g. combined with de-foaming **[2022.01]**

33/71 • • working at super-atmospheric pressure, e.g. in pressurised vessels **[2022.01]**

33/80 • Mixing plants; Combinations of mixers **[2022.01]**

33/81 • • Combinations of similar mixers, e.g. with rotary stirring devices in two or more receptacles **[2022.01]**

33/82 • • Combinations of dissimilar mixers **[2022.01]**

33/83 • • Mixing plants specially adapted for mixing in combination with disintegrating operations **[2022.01]**

33/84 • • Mixing plants with mixing receptacles receiving material dispensed from several component receptacles, e.g. paint tins **[2022.01]**

33/841 • • • with component receptacles fixed in a circular configuration on a horizontal table, e.g. the table being able to be indexed about a vertical axis **[2022.01]**

33/85 • • Mixing plants with mixing receptacles or mixing tools that can be indexed into different working positions **[2022.01]**

33/87 • Roll-type mixers **[2022.01]**

35/00 Accessories for mixers; Auxiliary operations or auxiliary devices; Parts or details of general application [2022.01]

35/10 • Maintenance of mixers **[2022.01]**

35/11 • • using fluids **[2022.01]**

35/12 • • using mechanical means **[2022.01]**

35/13 • • using one or more of the components of the mixture to wash-out the mixer **[2022.01]**

35/20 • Measuring; Control or regulation **[2022.01]**

35/21 • • Measuring **[2022.01]**

35/212 • • • of the driving system data, e.g. torque, speed or power data **[2022.01]**

35/213 • • • of the properties of the mixtures, e.g. temperature, density or colour **[2022.01]**

35/214 • • • characterised by the means for measuring **[2022.01]**

35/22 • • Control or regulation **[2022.01]**

35/221 • • • of operational parameters, e.g. level of material in the mixer, temperature or pressure **[2022.01]**

35/222 • • • of the operation of the driving system, e.g. torque, speed or power of motors; of the position of mixing devices or elements **[2022.01]**

35/30 • Driving arrangements; Transmissions; Couplings; Brakes **[2022.01]**

35/31 • • Couplings **[2022.01]**

35/32 • • Driving arrangements **[2022.01]**

35/33 • • Transmissions; Means for modifying the speed or direction of rotation **[2022.01]**

35/40 • Mounting or supporting mixing devices or receptacles; Clamping or holding arrangements therefor **[2022.01]**

35/41 • • Mounting or supporting stirrer shafts or stirrer units on receptacles **[2022.01]**

35/42 • • Clamping or holding arrangements for mounting receptacles on mixing devices **[2022.01]**

35/43 • • Supporting receptacles on frames or stands **[2022.01]**

35/45 • Closures or doors specially adapted for mixing receptacles; Operating mechanisms therefor **[2022.01]**

35/50 • Mixing receptacles **[2022.01]**

35/51 • • characterised by their material **[2022.01]**

35/511 • • provided with liners, e.g. wear resistant or flexible liners **[2022.01]**

35/512 • • characterised by surface properties, e.g. coated or rough **[2022.01]**

35/513 • • Flexible receptacles, e.g. bags supported by rigid containers **[2022.01]**

35/52 • • Receptacles with two or more compartments **[2022.01]**

35/53 • • characterised by the configuration of the interior, e.g. baffles for facilitating the mixing of components **[2022.01]**
35/60 • Safety arrangements **[2022.01]**
35/71 • Feed mechanisms (with proportioning B01F 35/80) **[2022.01]**
35/75 • Discharge mechanisms **[2022.01]**
35/80 • Forming a predetermined ratio of the substances to be mixed (controlling ratio of two or more flows of fluid or fluent material G05D 11/02) **[2022.01]**
35/81 • • Forming mixtures with changing ratios or gradients **[2022.01]**
35/82 • • by adding a material to be mixed to a mixture in response to a detected feature, e.g. density, radioactivity, consumed power or colour **[2022.01]**
35/83 • • by controlling the ratio of two or more flows, e.g. using flow sensing or flow controlling devices **[2022.01]**
35/88 • • by feeding the materials batchwise **[2022.01]**
35/90 • Heating or cooling systems **[2022.01]**
35/91 • • using gas or liquid injected into the material, e.g. using liquefied carbon dioxide or steam **[2022.01]**
35/92 • • for heating the outside of the receptacle, e.g. heated jackets or burners **[2022.01]**
35/93 • • arranged inside the receptacle **[2022.01]**
35/94 • • using radiation, e.g. microwaves or electromagnetic radiation **[2022.01]**
35/95 • • using heated or cooled stirrers **[2022.01]**

Indexing scheme associated with groups B01F 21/00-B01F 35/00 and relating to the nature of the mixed materials, the field of application and complementary technical information about mixing [2022.01]

101/00 Mixing characterised by the nature of the mixed materials or by the application field [2022.01]

101/02 • Mixing or agitating during harvesting or mowing, e.g. mixing with solid harvested products or particles **[2022.01]**
101/04 • Mixing biocidal, pesticidal or herbicidal ingredients used in agriculture or horticulture, e.g. for spraying **[2022.01]**
101/06 • Mixing of food ingredients **[2022.01]**
101/07 • • Mixing ingredients into milk or cream, e.g. aerating **[2022.01]**
101/08 • • Mixing of dough **[2022.01]**
101/09 • • Mixing of cereals, grains or seeds materials **[2022.01]**
101/10 • • Mixing of butter or margarine ingredients **[2022.01]**
101/11 • • Mixing of cheese ingredients **[2022.01]**
101/12 • • Mixing of chocolate ingredients **[2022.01]**
101/13 • • Mixing of ice-cream ingredients **[2022.01]**
101/14 • • Mixing of ingredients for non-alcoholic beverages; Dissolving sugar in water **[2022.01]**
101/15 • • Mixing of beer ingredients **[2022.01]**
101/16 • • Mixing wine or other alcoholic beverages; Mixing ingredients thereof **[2022.01]**
101/17 • • • Aeration of wine **[2022.01]**
101/18 • • Mixing animal food ingredients **[2022.01]**
101/19 • Mixing dentistry compositions **[2022.01]**
101/20 • Mixing of ingredients for bone cement **[2022.01]**
101/21 • Mixing of ingredients for cosmetic or perfume compositions **[2022.01]**
101/22 • Mixing of ingredients for pharmaceutical or medical compositions **[2022.01]**
101/23 • Mixing of laboratory samples e.g. in preparation of analysing or testing properties of materials **[2022.01]**
101/24 • Mixing of ingredients for cleaning compositions **[2022.01]**
101/25 • Mixing waste with other ingredients **[2022.01]**
101/26 • Mixing ingredients for casting metals **[2022.01]**
101/27 • Mixing ingredients for grinding, polishing or lapping materials **[2022.01]**
101/28 • Mixing cement, mortar, clay, plaster or concrete ingredients **[2022.01]**
101/30 • Mixing paints or paint ingredients, e.g. pigments, dyes, colours, lacquers or enamel **[2022.01]**
101/32 • Mixing fertiliser ingredients **[2022.01]**
101/33 • • Mixing compost ingredients or organic waste **[2022.01]**
101/34 • Mixing fuel and prill, i.e. water or other fluids mixed with solid explosives, to obtain liquid explosive fuel emulsions or slurries **[2022.01]**
101/35 • Mixing inks or toners **[2022.01]**
101/36 • Mixing of ingredients for adhesives or glues; Mixing adhesives and gas **[2022.01]**
101/38 • Mixing of asphalt, bitumen, tar or pitch or their ingredients **[2022.01]**
101/39 • Mixing of ingredients for grease or lubricating compositions **[2022.01]**
101/40 • Mixing of ingredients for oils, fats or waxes **[2022.01]**
101/44 • Mixing of ingredients for microbiology, enzymology, in vitro culture or genetic manipulation **[2022.01]**
101/45 • Mixing in metallurgical processes of ferrous or non-ferrous materials **[2022.01]**
101/47 • Mixing of ingredients for making paper pulp, e.g. wood fibres or wood pulp **[2022.01]**
101/48 • Mixing water in water-taps with other ingredients, e.g. air, detergents or disinfectants **[2022.01]**
101/49 • Mixing drilled material or ingredients for well-drilling, earth-drilling or deep-drilling compositions with liquids to obtain slurries **[2022.01]**
101/50 • Mixing mined ingredients and liquid to obtain slurries **[2022.01]**
101/54 • Mixing liquid fragrances with air **[2022.01]**
101/55 • Mixing liquid air humidifiers with air **[2022.01]**
101/56 • Mixing photosensitive chemicals or photographic base materials **[2022.01]**
101/57 • Mixing radioactive materials, e.g. nuclear materials **[2022.01]**
101/58 • Mixing semiconducting materials, e.g. during semiconductor or wafer manufacturing processes **[2022.01]**
101/59 • Mixing reaction ingredients for fuel cells **[2022.01]**

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

Note(s) [2, 3, 6]

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; 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]**

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]**

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 group B01J 20/00 and in each set of groups B01J 21/00-B01J 31/00 and B01J 32/00-B01J 38/00, 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]**
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]**

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]**
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]**
27/043 • • • with iron group metals or platinum group metals **[4, 2006.01]**
27/045 • • • • Platinum group metals **[4, 2006.01]**
27/047 • • • with chromium, molybdenum, tungsten or polonium **[4, 2006.01]**
27/049 • • • • with iron group metals or platinum group metals **[4, 2006.01]**
27/051 • • • • Molybdenum **[4, 2006.01]**
27/053 • • Sulfates **[4, 2006.01]**
27/055 • • • with alkali metals, copper, gold or silver **[4, 2006.01]**
27/057 • • Selenium or tellurium; Compounds thereof **[4, 2006.01]**
27/06 • Halogens; Compounds thereof **[4, 2006.01]**
27/08 • • Halides **[2, 2006.01]**
27/10 • • • Chlorides **[2, 2006.01]**
27/12 • • • Fluorides **[2, 2006.01]**

27/122 • • • of copper **[4, 2006.01]**
27/125 • • with scandium, yttrium, aluminium, gallium, indium or thallium **[4, 2006.01]**
27/128 • • with iron group metals or platinum group metals **[4, 2006.01]**
27/13 • • • Platinum group metals **[4, 2006.01]**
27/132 • • with chromium, molybdenum, tungsten or polonium **[4, 2006.01]**
27/135 • • with titanium, zirconium, hafnium, germanium, tin or lead **[4, 2006.01]**
27/138 • • with alkaline earth metals, magnesium, beryllium, zinc, cadmium or mercury **[4, 2006.01]**
27/14 • Phosphorus; Compounds thereof **[4, 2006.01]**
27/16 • • containing oxygen **[2, 2006.01]**
27/18 • • • with metals **[2, 2006.01]**
27/182 • • with silicon **[4, 2006.01]**
27/185 • • with iron group metals or platinum group metals **[4, 2006.01]**
27/186 • • with arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium **[5, 2006.01]**
27/187 • • • with manganese, technetium or rhenium **[5, 2006.01]**
27/188 • • • with chromium, molybdenum, tungsten or polonium **[4, 5, 2006.01]**
27/19 • • • • Molybdenum **[4, 5, 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]**
27/32 • • of catalysts comprising compounds of halogens **[2, 2006.01]**

29/00 Catalysts comprising molecular sieves [2, 2006.01]

Note(s) [6]

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, 2006.01]**
29/035 • • Crystalline silica polymorphs, e.g. silicalites **[6, 2006.01]**
29/04 • having base-exchange properties, e.g. crystalline zeolites, pillared clays **[2, 6, 2006.01]**
29/06 • • Crystalline aluminosilicate zeolites; Isomorphous compounds thereof **[2, 2006.01]**
29/064 • • • containing iron group metals, noble metals or copper **[6, 2006.01]**
29/068 • • • • Noble metals **[6, 2006.01]**
29/072 • • • • Iron group metals or copper **[6, 2006.01]**
29/076 • • • containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium **[6, 2006.01]**
29/08 • • • of the faujasite type, e.g. type X or Y **[2, 2006.01]**
29/10 • • • • containing iron group metals, noble metals or copper **[2, 2006.01]**
29/12 • • • • • Noble metals **[2, 2006.01]**
29/14 • • • • • Iron group metals or copper **[2, 2006.01]**
29/16 • • • • containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium **[2, 2006.01]**
29/18 • • • of the mordenite type **[2, 2006.01]**
29/20 • • • • containing iron group metals, noble metals or copper **[2, 2006.01]**
29/22 • • • • • Noble metals **[2, 2006.01]**
29/24 • • • • • Iron group metals or copper **[2, 2006.01]**
29/26 • • • • containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium **[2, 2006.01]**
29/40 • • • of the pentasil type, e.g. types ZSM-5, ZSM-8 or ZSM-11 **[6, 2006.01]**
29/42 • • • • containing iron group metals, noble metals or copper **[6, 2006.01]**
29/44 • • • • • Noble metals **[6, 2006.01]**
29/46 • • • • • Iron group metals or copper **[6, 2006.01]**
29/48 • • • • containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium **[6, 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]

35/02 • Solids **[2, 2006.01]**

35/04 • • Foraminous structures, sieves, grids, honeycombs **[2, 2006.01]**

35/06 • • Fabrics or filaments **[2, 2006.01]**

35/08 • • Spheres **[2, 2006.01]**

35/10 • • characterised by their surface properties or porosity **[2, 2006.01]**

35/12 • Liquids or melts **[2, 2006.01]**

37/00 Processes, in general, for preparing catalysts; Processes, in general, for activation of catalysts [4, 2006.01]

37/02 • Impregnation, coating or precipitation (protecting by coating B01J 33/00) **[2, 2006.01]**

37/025 • • using a distinct intermediate layer, e.g. substrate-support-active layer **[6, 2006.01]**

37/03 • • Precipitation; Co-precipitation **[4, 2006.01]**

37/04 • Mixing **[2, 2006.01]**

37/06 • Washing **[2, 2006.01]**

37/08 • Heat treatment **[2, 2006.01]**

37/10 • • in the presence of water, e.g. steam **[2, 2006.01]**

37/12 • Oxidising **[2, 2006.01]**

37/14 • • with gases containing free oxygen **[2, 2006.01]**

37/16 • Reducing **[2, 2006.01]**

37/18 • • with gases containing free hydrogen **[2, 2006.01]**

37/20 • Sulfiding **[2, 2006.01]**

37/22 • Halogenating **[2, 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]**

38/00 Regeneration or reactivation of catalysts, in general [4, 2006.01]
38/02 • Heat treatment **[4, 2006.01]**
38/04 • Gas or vapour treating; Treating by using liquids vaporisable upon contacting spent catalyst **[4, 2006.01]**
38/06 • • using steam **[4, 2006.01]**
38/08 • • using ammonia or derivatives thereof **[4, 2006.01]**
38/10 • • using elemental hydrogen **[4, 2006.01]**
38/12 • • Treating with free oxygen-containing gas **[4, 2006.01]**
38/14 • • • with control of oxygen content in oxidation gas **[4, 2006.01]**
38/16 • • • Oxidation gas comprising essentially steam and oxygen **[4, 2006.01]**
38/18 • • • with subsequent reactive gas treating **[4, 2006.01]**
38/20 • • • Plural distinct oxidation stages **[4, 2006.01]**
38/22 • • • Moving bed, e.g. vertically or horizontally moving bulk **[4, 2006.01]**
38/24 • • • • having mainly transverse, i.e. lateral, flow of oxygen-containing gas and material **[4, 2006.01]**
38/26 • • • • having mainly counter-current flow of oxygen-containing gas and material **[4, 2006.01]**
38/28 • • • • having mainly concurrent flow of oxygen-containing gas and material **[4, 2006.01]**
38/30 • • • in gaseous suspension, e.g. fluidised bed **[4, 2006.01]**
38/32 • • • • Indirectly heating or cooling material within regeneration zone or prior to entry into regeneration zone **[4, 2006.01]**
38/34 • • • • with plural distinct serial combustion stages **[4, 2006.01]**
38/36 • • • • and with substantially complete oxidation of carbon monoxide to carbon dioxide within regeneration zone **[4, 2006.01]**
38/38 • • • and adding heat by solid heat carrier **[4, 2006.01]**
38/40 • • • and forming useful by-products **[4, 2006.01]**
38/42 • • using halogen-containing material **[4, 2006.01]**
38/44 • • • and adding simultaneously or subsequently free oxygen; using oxyhalogen compound **[4, 2006.01]**
38/46 • • • fluorine-containing **[4, 2006.01]**
38/48 • Liquid treating or treating in liquid phase, e.g. dissolved or suspended **[4, 2006.01]**
38/50 • • using organic liquids **[4, 2006.01]**
38/52 • • • oxygen-containing **[4, 2006.01]**
38/54 • • • halogen-containing **[4, 2006.01]**
38/56 • • • Hydrocarbons **[4, 2006.01]**
38/58 • • • and gas addition thereto **[4, 2006.01]**
38/60 • • using acids **[4, 2006.01]**
38/62 • • • organic **[4, 2006.01]**
38/64 • • using alkaline material; using salts **[4, 2006.01]**
38/66 • • • using ammonia or derivatives thereof **[4, 2006.01]**
38/68 • • including substantial dissolution or chemical precipitation of a catalyst component in the ultimate reconstitution of the catalyst **[4, 2006.01]**
38/70 • • Wet oxidation of material submerged in liquid **[4, 2006.01]**
38/72 • including segregation of diverse particles **[4, 2006.01]**
38/74 • utilising ion-exchange **[4, 2006.01]**

Ion-exchange [3]

Note(s) [3]

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, 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]**

B01L CHEMICAL OR PHYSICAL LABORATORY APPARATUS FOR GENERAL USE

Note(s)

This subclass covers only laboratory apparatus which is either applicable solely to laboratory purposes or which, by reason of its simple construction and adaptability, is such as would not be suitable for industrial use.

1/00 Enclosures; Chambers (provided with manipulation devices or glove boxes B25J 21/00) **[1, 2006.01]**

1/02 • Air-pressure chambers; Air-locks therefor **[1, 2006.01]**

1/04 • Dust-free rooms or enclosures **[1, 2006.01]**

3/00 Containers or dishes for laboratory use, e.g. laboratory glassware; Droppers [1, 2006.01]

Note(s) [2023.01]

Petri dishes for enzymology or microbiology are classified in group C12M 1/22.

3/02 • Burettes; Pipettes **[1, 2006.01]**

3/04 • Crucibles **[1, 2006.01]**

3/06 • Crystallising dishes **[1, 2006.01]**

3/08 • Flasks **[1, 2006.01]**

3/10 • Wash bottles **[1, 2006.01]**

3/12 • Gas jars or cylinders **[1, 2006.01]**

3/14 • Test tubes **[1, 2006.01]**

3/16 • Retorts **[1, 2006.01]**

3/18 • Spatulas **[1, 2006.01]**

5/00 Gas handling apparatus (gas jars or cylinders B01L 3/12; cold traps or cold baffles B01D 8/00) **[1, 2006.01]**

5/02 • Gas collection apparatus, e.g. by bubbling under water (for sampling G01N 1/22) **[1, 2006.01]**

5/04 • Gas washing apparatus, e.g. by bubbling **[1, 2006.01]**

7/00 Heating or cooling apparatus (autoclaves B01J 3/04)**; Heat insulating devices [1, 3, 2006.01]**

7/02 • Water baths; Sand baths; Air baths **[1, 2006.01]**

7/04 • Heat insulating devices, e.g. jackets for flasks **[2010.01]**

9/00 Supporting devices; Holding devices [1, 2006.01]

9/02 • Laboratory benches or tables; Fittings therefor **[1, 2006.01]**

9/04 • Retort stands; Retort clamps **[1, 2006.01]**

9/06 • Test-tube stands; Test-tube holders **[1, 2006.01]**

99/00 Subject matter not provided for in other groups of this subclass [2010.01]