SECTION B — PERFORMING OPERATIONS; TRANSPORTING

B01 PHYSICAL OR CHEMICAL PROCESSES OR APPARATUS IN GENERAL

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)

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.

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TREATING GASES OR VAPOURS: SEPARATION, RECOVERING, CHEMICAL OR BIOLOGICAL PURIFICATION OF WASTE GASES....53/00
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SEPARATION OF DISPERSED PARTICLES FROM GASES OR VAPOURS
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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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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)
1/02 • Evaporators with heating coils
1/04 • Evaporators with horizontal tubes
1/06 • Evaporators with vertical tubes
1/08 • • with short tubes (B01D 1/12 takes precedence)
1/10 • • with long tubes, e.g. Kestner evaporators (B01D 1/12 takes precedence)
1/12 • • and forced circulation
1/14 • with heated gases or vapours in contact with the liquid
1/16 • by spraying (B01D 1/22 takes precedence)
1/18 • • to obtain dry solids (B01D 1/24 takes precedence)
1/20 • • Sprayers
1/22 • by bringing a thin layer of the liquid into contact with a heated surface
1/24 • • to obtain dry solids
1/26 • Multiple-effect evaporating
1/28 • with vapour compression
1/30 • Accessories for evaporators

3/00 **Distillation or related exchange processes in which liquids are contacted with gaseous media, e.g. stripping [2]**
3/02 • in boilers or stills **[2]**
3/04 • pipe stills
3/06 • Flash distillation **[2]**
3/08 • in rotating vessels; Atomisation on rotating discs (B01D 3/10 takes precedence)
3/10 • Vacuum distillation (B01D 3/12 takes precedence) **[2]**
3/12 • Molecular distillation **[2]**
3/14 • Fractional distillation
3/16 • • Fractionating columns in which vapour bubbles through liquid
3/18 • • • with horizontal bubble plates
3/20 • • • • Bubble caps; Risers for vapour; Discharge pipes for liquid
3/22 • • • with horizontal sieve plates or grids; Construction of sieve plates or grids
3/24 • • • with sloping plates or elements mounted stepwise
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
3/28 • • • Fractionating columns with surface contact and vertical guides, e.g. film action
3/30 • • Fractionating columns with movable parts or in which centrifugal movement is caused
3/32 • • Other features of fractionating columns
3/34 • with one or more auxiliary substances
3/36 • • Azeotropic distillation
3/38 • • Steam distillation
3/40 • • Extractive distillation
3/42 • Regulation; Control

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

7/00 **Sublimation** (B01D 8/00 takes precedence; freeze-drying F26)
7/02 • Crystallisation directly from the vapour phase (into single crystals C30B 23/00) **[2]**

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

9/00 **Crystallisation** (crystallisation directly from the vapour phase B01D 7/02; making single crystals C30B)
9/02 • from solutions
9/04 • • concentrating solutions by removing frozen solvent therefrom

11/00 **Solvent extraction**
11/02 • of solids
11/04 • of solutions which are liquid

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

15/00 **Separating processes involving the treatment of liquids with solid sorbents; Apparatus therefor [4]**
15/02 • with moving adsorbents
15/04 • with ion-exchange materials as adsorbents (B01D 15/36 takes precedence) **[1, 2006.01]**
15/08 • Selective adsorption, e.g. chromatography

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
17/02 • Separation of non-miscible liquids
17/022 • • by contact with a preferentially wettable solid **[4]**
17/025 • • by gravity, in a settling tank **[4]**
17/028 • • • provided with a set of baffles **[4]**
17/032 • • • provided with special equipment for removing at least one of the separated liquids **[4]**
17/035 • • by using gas-bubbles or moving solids introduced into the mixture **[4]**
17/038 • • by centrifugal force (centrifuges B04B; cyclones B04C) **[4]**
17/04 • • Breaking emulsions
17/05 • • • by chemical treatment **[4]**
17/06 • Separation of liquids from each other by electricity
17/09 • by thermal diffusion **[4]**
17/12 • Auxiliary equipment particularly adapted for use with liquid-separating apparatus, e.g. control circuits **[4]**

19/00 Degasification of liquids
19/02 • Foam dispersion or prevention
19/04 • • by addition of chemical substances

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

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]**
24/02 • with the filter bed stationary during the filtration **[5]**
24/04 • • the filtering material being clamped between pervious fixed walls (B01D 24/10, B01D 24/20 take precedence) **[5]**
24/06 • • • the pervious walls comprising a series of louvres or slots **[5]**
24/08 • • • the filtering material being supported by at least two pervious coaxial walls **[5]**
24/10 • • the filtering material being held in a closed container **[5]**
24/12 • • • Downward filtration, the filtering material being supported by pervious surfaces (B01D 24/18 takes precedence) **[5]**
24/14 • • • Downward filtration, the container having distribution or collection headers or pervious conduits (B01D 24/18 takes precedence) **[5]**
24/16 • • • Upward filtration (B01D 24/18 takes precedence) **[5]**
24/18 • • • Combined upward and downward filtration **[5]**
24/20 • • the filtering material being provided in an open container **[5]**
24/22 • • • Downward filtration, the filter material being supported by pervious surfaces **[5]**
24/24 • • • Downward filtration, the container having distribution or collection headers or pervious conduits **[5]**
24/26 • • • Upward filtration **[5]**
24/28 • with the filter bed moving during the filtration (with the filter bed fluidised B01D 24/36) **[5]**
24/30 • • Translation **[5]**
24/32 • • Rotation **[5]**
24/34 • with the filtering material and its pervious support moving (tipping buckets, trays or like sections B01D 33/327) **[5]**
24/36 • with the filter bed fluidised during the filtration (with the filter bed being stationary B01D 24/02) **[5]**
24/38 • Feed or discharge devices **[5]**
24/40 • • for feeding **[5]**
24/42 • • for discharging filtrate **[5]**
24/44 • • for discharging filter cake, e.g. chutes **[5]**
24/46 • Regenerating the filtering material in the filter (B01D 24/44 takes precedence) **[5]**
24/48 • integrally combined with devices for controlling the filtration **[5]**

25/00 Filters formed by clamping together several filtering elements or parts of such elements (disc filters B01D 29/39) **[5]**
25/02 • in which the elements are pre-formed independent filtering units, e.g. modular systems
25/12 • Filter presses, i.e. of the plate or plate and frame type
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]**
25/133 • • • with compression of the filter cake, e.g. by inflatable membranes **[5]**
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]**
25/168 • • • with compression of the filter cake, e.g. by inflatable membranes **[5]**
25/172 • • Plate spreading means (removal of filter cakes B01D 25/32) **[5]**
25/176 • • attaching the filter element to the filter press plates, e.g. around the central feed hole in the plates **[5]**
25/19 • • Clamping means for closing the filter press, e.g. hydraulic jacks **[5]**
25/21 • • Plate and frame presses (B01D 25/172, B01D 25/176, B01D 25/19 take precedence) **[5]**
25/22 • Cell-type filters
25/24 • • Cell-type roll filters
25/26 • • Cell-type stack filters
25/28 • Leaching or washing filter cakes in the filter
25/30 • Feeding devices
25/32 • Removal of filter cakes

25/34 • • by moving the filter elements
25/36 • • • by centrifugal force
25/38 • • by moving parts, e.g. scrapers, contacting stationary filter elements

27/00 Cartridge filters of the throw-away type [5]
27/02 • with cartridges made from a mass of loose material
27/04 • with cartridges made of a piece of unitary material, e.g. filter paper
27/06 • • with corrugated, folded or wound material
27/07 • • • having a coaxial stream through the filtering element **[5]**
27/08 • Construction of the casing
27/10 • Safety devices, e.g. by-passes
27/14 • having more than one filtering element **[5]**

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
29/01 • with flat filtering elements (B01D 29/39 takes precedence) **[5]**
29/03 • • self-supporting **[5]**
29/05 • • supported **[5]**
29/07 • • • with corrugated, folded or wound filtering sheets **[5]**
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]**

Note(s)

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]**

Note(s)

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]**
29/11 • with bag, cage, hose, tube, sleeve or like filtering elements **[5]**
29/13 • • Supported filter elements **[5]**
29/15 • • • arranged for inward flow filtration **[5]**
29/17 • • • • open-ended **[5]**
29/19 • • • • on solid frames with surface grooves or the like **[5]**
29/21 • • • • with corrugated, folded or wound sheets **[5]**
29/23 • • • arranged for outward flow filtration **[5]**
29/25 • • • • open-ended **[5]**
29/27 • • • • Filter bags **[5]**
29/31 • • Self-supporting filtering elements **[5]**
29/33 • • • arranged for inward flow filtration **[5]**
29/35 • • • arranged for outward flow filtration **[5]**
29/37 • • • open-ended **[5]**
29/39 • with hollow discs side by side on, or around, one or more tubes, e.g. of the leaf type **[5]**
29/41 • • mounted transversely on the tube **[5]**
29/43 • • mounted otherwise than transversely on the tube **[5]**
29/44 • Edge filtering elements, i.e. using contiguous impervious surfaces **[4]**
29/46 • • of flat, stacked bodies **[4]**
29/48 • • of spirally or helically wound bodies **[4]**
29/50 • with multiple filtering elements, characterised by their mutual disposition (B01D 29/39 takes precedence) **[5]**
29/52 • • in parallel connection **[5]**
29/54 • • • arranged concentrically or coaxially **[5]**
29/56 • • in series connection **[5]**
29/58 • • • arranged concentrically or coaxially **[5]**
29/60 • integrally combined with devices for controlling the filtration **[5]**
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]**
29/64 • • by scrapers, brushes or the like, acting on the cake side of the filtering element **[5]**
29/66 • • by flushing, e.g. counter-current air-bumps **[5]**
29/68 • • • with backwash arms, shoes or nozzles **[5]**
29/70 • • by forces created by movement of the filter element **[5]**
29/72 • • • involving vibrations **[5]**
29/74 • • • involving centrifugal force **[5]**
29/76 • Handling the filter cake in the filter for purposes other than for regenerating (B01D 29/94 takes precedence) **[5]**
29/78 • • for washing **[5]**
29/80 • • for drying **[5]**
29/82 • • • by compression **[5]**
29/84 • • • by gases or by heating **[5]**
29/86 • • Retarding cake deposition on the filter during the filtration period, e.g. using stirrers **[5]**
29/88 • having feed or discharge devices **[5]**
29/90 • • for feeding **[5]**
29/92 • • for discharging filtrate **[5]**
29/94 • • for discharging the filter cake, e.g. chutes **[5]**
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]**

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) **[5]**
33/01 • with translationally moving filtering elements, e.g. pistons (B01D 33/04-B01D 33/327 take precedence) **[5]**
33/03 • • with vibrating filter elements **[5]**
33/04 • with filtering bands or the like supported on cylinders which are impervious for filtering **[5]**
33/044 • with filtering bands or the like supported on cylinders which are pervious for filtering **[5]**
33/048 • • with endless filtering bands **[5]**
33/052 • • • combined with a compression device (B01D 33/64 takes precedence) **[5]**
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]**
33/06 • with rotary cylindrical filtering surfaces, e.g. hollow drums (B01D 33/044 takes precedence)
33/067 • • Construction of the filtering drums, e.g. mounting or sealing arrangements **[5]**
33/073 • • arranged for inward flow filtration **[5]**

33/09 • • • with surface cells independently connected to pressure distributors **[5]**
33/11 • • arranged for outward flow filtration **[5]**
33/13 • • • with surface cells independently connected to pressure distributors **[5]**
33/15 • with rotary plane filtering surfaces **[5]**
33/17 • • with rotary filtering tables (tables divided into separately tiltable buckets, trays or like sections B01D 33/327) **[5]**
33/19 • • • the table surface being divided in successively tilted sectors or cells, e.g. for discharging the filter cake **[5]**
33/21 • • with hollow filtering discs transversely mounted on a hollow rotary shaft **[5]**
33/23 • • • Construction of discs or component sectors thereof **[5]**
33/25 • • with hollow frames axially mounted on a hollow rotary shaft **[5]**
33/27 • with rotary filtering surfaces, which are neither cylindrical nor planar, e.g. helical surfaces **[5]**
33/29 • the movement of the filter elements being a combination of movements (B01D 33/19 takes precedence) **[5]**
33/31 • • Planetary movement **[5]**
33/327 • • Tipping buckets, trays or like sections **[5]**
33/333 • with individual filtering elements moving along a closed path (tipping buckets, trays or like sections B01D 33/327) **[5]**
33/35 • with multiple filtering elements characterised by their mutual disposition (B01D 33/21 takes precedence) **[5]**
33/37 • • in parallel connection **[5]**
33/39 • • • concentrically or coaxially **[5]**
33/41 • • in series connection **[5]**
33/42 • • • concentrically or coaxially **[5]**
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]**
33/46 • • by scrapers, brushes or the like acting on the cake-side of the filtering element **[5]**
33/48 • • by flushing, e.g. counter-current air-bumps **[5]**
33/50 • • • with backwash arms, shoes or nozzles **[5]**
33/52 • • by forces created by movement of the filter element **[5]**
33/54 • • • involving vibrations **[5]**
33/56 • • • involving centrifugal force **[5]**
33/58 • Handling the filter cake in the filter for purposes other than for regenerating (B01D 33/76 takes precedence) **[5]**
33/60 • • for washing **[5]**
33/62 • • for drying **[5]**
33/64 • • • by compression **[5]**
33/66 • • • by gases or by heating **[5]**
33/68 • • Retarding cake deposition on the filter during the filtration period, e.g. using stirrers **[5]**
33/70 • having feed or discharge devices (B01D 33/82 takes precedence) **[5]**
33/72 • • for feeding **[5]**
33/74 • • for discharging filtrate **[5]**
33/76 • • for discharging the filter cake, e.g. chutes **[5]**
33/80 • Accessories **[5]**
33/82 • • Means for pressure distribution **[5]**

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
35/01 • Devices for the removal of gas, e.g. air purge systems **[5]**
35/02 • Filters adapted for location in special places, e.g. pipe-lines, pumps, stop-cocks (B01D 35/05 takes precedence)
35/027 • • rigidly mounted in or on tanks or reservoirs (B01D 35/04 takes precedence) **[5]**
35/04 • • Plug, tap, or cock filters
35/05 • Floating filters **[5]**
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) **[5]**
35/10 • Brush filters
35/12 • Devices for taking out of action one or more units of multi-unit filters, e.g. for regeneration
35/14 • Safety devices specially adapted for filtration; Devices for indicating clogging (incorporated in a throw-away filter B01D 27/10)
35/143 • • Filter condition indicators **[5]**
35/147 • • Bypass or safety valves **[5]**
35/15 • • Bidirectional working filters **[5]**
35/153 • • Anti-leakage or anti-return valves **[5]**
35/157 • • Flow control valves; Damping or calibrated passages **[5]**
35/16 • Cleaning-out devices
35/18 • Heating or cooling the filters
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) **[5]**
35/22 • Directing the mixture to be filtered on to the filters in a manner to clean the filters
35/24 • Providing loose granular material to scratch the filters clean
35/26 • Filters with built-in pumps
35/28 • Strainers not provided for elsewhere
35/30 • Filter housing constructions **[4]**
35/31 • • including arrangements for environmental protection, e.g. pressure resisting features **[5]**
35/32 • • • against radiation **[5]**
35/34 • • open-topped (B01D 35/31 takes precedence) **[5]**

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]**
36/02 • Combinations of filters of different kinds (B01D 29/50, B01D 33/35 take precedence) **[4, 5]**
36/04 • Combinations of filters with settling tanks **[4]**

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

39/00 Filtering material for liquid or gaseous fluids
39/02 • Loose filtering material, e.g. loose fibres

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

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

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)

Separating dispersed particles from gases or vapours

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

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)
46/02 • Particle separators, e.g. dust precipitators, having hollow filters made of flexible material
46/04 • • Cleaning filters
46/06 • • with means keeping the working surfaces flat
46/08 • • • the working surfaces forming a star shape
46/10 • Particle separators, e.g. dust precipitators, using filter plates, sheets, or pads having plane surfaces
46/12 • • in multiple arrangements
46/14 • • arranged in a star shape
46/16 • • arranged on non-filtering conveyors
46/18 • Particle separators, e.g. dust precipitators, using filtering belts
46/20 • • the belts combined with drums
46/22 • • the belts travelling during filtering
46/24 • Particle separators, e.g. dust precipitators, using rigid hollow filter bodies
46/26 • • rotatable
46/28 • Particle separators, e.g. dust precipitators, using filter brushes
46/30 • Particle separators, e.g. dust precipitators, using loose filtering material
46/32 • • the material moving during filtering
46/34 • • • not horizontally, e.g. using shoots
46/36 • • • as a substantially horizontal layer, e.g. on rotary tables, drums or conveyor belts
46/38 • • • as fluidised bed
46/40 • Particle separators, e.g. dust precipitators, using edge filters, i.e. using contiguous impervious surfaces
46/42 • Auxiliary equipment or operation thereof
46/44 • • controlling filtration
46/46 • • • automatic
46/48 • • Removing dust other than cleaning filters
46/50 • • Means for discharging electrostatic potential
46/52 • Particle separators, e.g. dust precipitators, using filters embodying folded material
46/54 • Particle separators, e.g. dust precipitators, using ultra-fine filter sheets or diaphragms

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

49/00 Separating dispersed particles from gases, air or vapours by other methods
49/02 • by thermal repulsion

50/00 Combinations of devices for separating particles from gases or vapours

51/00 Auxiliary pretreatment of gases or vapours to be cleaned from dispersed particles [6]
51/02 • Amassing the particles, e.g. by flocculation
51/04 • • by seeding, e.g. by adding particles
51/06 • • by varying the pressure of the gas or vapour
51/08 • • • by sound or ultrasonics
51/10 • Conditioning the gas to be cleaned

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) **[3, 5]**

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

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

57/00 Separation, other than separation of solids, not fully covered by a single other group or subclass, e.g. B03C
57/02 • by electrophoresis **[3, 5]**

59/00 Separation of different isotopes of the same chemical element
59/02 • Separation by phase transition
59/04 • • by distillation
59/06 • • by fractional melting; by zone melting
59/08 • • by fractional crystallisation, by precipitation, by zone freezing
59/10 • Separation by diffusion
59/12 • • by diffusion through barriers
59/14 • • • Construction of the barrier
59/16 • • by thermal diffusion
59/18 • • by separation jets
59/20 • Separation by centrifuging
59/22 • Separation by extracting
59/24 • • by solvent extraction
59/26 • • by sorption, i.e. absorption, adsorption, persorption
59/28 • Separation by chemical exchange
59/30 • • by ion exchange
59/32 • • by exchange between fluids
59/33 • • • involving dual temperature exchange **[2]**
59/34 • Separation by photochemical methods
59/36 • Separation by biological methods
59/38 • Separation by electrochemical methods
59/40 • • by electrolysis
59/42 • • by electromigration; by electrophoresis
59/44 • Separation by mass spectrography (particle spectrometers or separator tubes H01J 49/00)
59/46 • • using only electrostatic fields
59/48 • • using electrostatic and magnetic fields
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

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)

In groups B01D 61/00-B01D 71/00, 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]**
61/02 • Reverse osmosis; Hyperfiltration **[5]**
61/04 • • Feed pretreatment **[5]**
61/06 • • Energy recovery **[5]**

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

63/00 Apparatus in general for separation processes using semi-permeable membranes [5]
63/02 • Hollow fibre modules **[5]**
63/04 • • comprising multiple hollow fibre assemblies **[5]**
63/06 • Tubular membrane modules **[5]**
63/08 • Flat membrane modules **[5]**
63/10 • Spiral-wound membrane modules **[5]**
63/12 • • comprising multiple spiral-wound assemblies **[5]**
63/14 • Pleat-type membrane modules **[5]**
63/16 • Rotary, reciprocated or vibrated modules **[5]**

65/00 Accessories or auxiliary operations, in general, for separation processes or apparatus using semi-permeable membranes [5]
65/02 • Membrane cleaning or sterilisation **[5]**
65/04 • • with movable bodies, e.g. foam balls **[5]**
65/06 • • with special washing compositions **[5]**
65/08 • Prevention of membrane fouling or of concentration polarisation **[5]**
65/10 • Testing of membranes or membrane apparatus; Detecting or repairing leaks **[5]**

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

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

Note(s)

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

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

Note(s)

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]**
71/04 • • Glass **[5]**
71/06 • Organic material **[5]**
71/08 • • Polysaccharides **[5]**
71/10 • • • Cellulose; Modified cellulose **[5]**
71/12 • • • Cellulose derivatives **[5]**
71/14 • • • • Esters of organic acids **[5]**
71/16 • • • • • Cellulose acetate **[5]**
71/18 • • • • • Mixed esters, e.g. cellulose acetate-butyrate **[5]**
71/20 • • • • Esters of inorganic acids, e.g. cellulose nitrate **[5]**
71/22 • • • • Cellulose ethers **[5]**
71/24 • • Rubbers **[5]**

Note(s)

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]**
71/28 • • Polymers of vinyl aromatic compounds **[5]**
71/30 • • Polyalkenyl halides **[5]**
71/32 • • • containing fluorine atoms **[5]**
71/34 • • • • Polyvinylidene fluoride **[5]**
71/36 • • • • Polytetrafluoroethene **[5]**
71/38 • • Polyalkenylalcohols; Polyalkenylesters; Polyalkenylethers; Polyalkenylaldehydes; Polyalkenylketones; Polyalkenylacetals; Polyalkenylketals **[5]**
71/40 • • Polymers of unsaturated acids or derivatives thereof, e.g. salts, amides, imides, nitriles, anhydrides, esters **[5]**
71/42 • • • Polymers of nitriles, e.g. polyacrylonitrile **[5]**

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]**

71/46 • • Epoxy resins **[5]**

71/48 • • Polyesters **[5]**

71/50 • • Polycarbonates **[5]**

71/52 • • Polyethers **[5]**

71/54 • • Polyureas; Polyurethanes **[5]**

71/56 • • Polyamides, e.g. polyester-amides **[5]**

71/58 • • Other polymers having nitrogen in the main chain, with or without oxygen or carbon only **[5]**

71/60 • • • Polyamines **[5]**

71/62 • • • Polycondensates having nitrogen-containing heterocyclic rings in the main chain **[5]**

71/64 • • • • Polyimides; Polyamide-imides; Polyester-imides; Polyamide acids or similar polyimide precursors **[5]**

71/66 • • Polymers having sulfur in the main chain, with or without nitrogen, oxygen or carbon only **[5]**

71/68 • • • Polysulfones; Polyethersulfones **[5]**

71/70 • • Polymers having silicon in the main chain, with or without sulfur, nitrogen, oxygen or carbon only **[5]**

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]**

71/74 • • Natural macromolecular material or derivatives thereof (B01D 71/08, B01D 71/24 take precedence) **[5]**

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]**

71/78 • • • Graft polymers **[5]**

71/80 • • • Block polymers **[5]**

71/82 • • • characterised by the presence of specified groups, e.g. introduced by chemical after-treatment **[5]**