

## SECTION B –PERFORMING OPERATIONS; TRANSPORTING

### SEPARATING; MIXING

#### Note

The following notes are meant to assist in the use of this part of the classification scheme; they must not be read as modifying in any way the elaborations.

- (1) In this sub-section, the separation of different materials, e.g. of different matter, size, or state, is predominantly found in the following subclasses:  
B01D  
B03B, B03C, B03D  
B04B, B04C  
B07B, B07C.
- (2) The classifying characteristics of these subclasses are:
  - (i) the physical state of the matter to be separated;
  - (ii) the principle of the process used;
  - (iii) particular kinds of apparatus.

The first of these characteristics involves six different aspects, assembled in three groups:

  - (a) liquid/liquid or liquid/gas and gas/gas;
  - (b) solid/liquid or solid/gas;
  - (c) solid/solid.
- (3) These subclasses are to be used according to the following general rules:
  - B01D is the most general class as far as separation other than solids from solids is concerned.
  - Apparatus for separating solids from solids are covered by B03B when the process concerned is regarded as the equivalent of “washing” in the sense of the mining art, even if such apparatus is a pneumatic one, especially pneumatic tables or jigs. Screens per se are not covered by this subclass but are classified in B07B, even if they are being used in a wet process. All other apparatus for the separation of solids from solids according to dry methods are classified in B07B.
  - If the separation takes place as a result of the detection or measurement of some feature of the material or articles to be sorted it is classified in B07C.
  - It should also be noted that the separation of isotopes of the same chemical element is covered by B01D 59/00, whatever process or apparatus is employed.

#### Subsection Index

##### LIQUID/LIQUID, LIQUID/GAS OR GAS/GAS SEPARATION

###### Method

General operations ..... B01D  
by centrifugal force, using  
centrifuges or free-vortex  
apparatus ..... B01D  
using magnetic or  
electrostatic effect ..... B03C

###### Apparatus

General operations ..... B01D  
by centrifugal force, using  
centrifuges or free-vortex  
apparatus ..... B04B,  
B04C  
using magnetic or  
electrostatic effect ..... B03C

##### SOLID/LIQUID OR SOLID/GAS SEPARATION

###### Method

General operations ..... B01D  
by centrifugal force ..... B01D  
using centrifuges or  
free-vortex apparatus ..... B01D  
using magnetic or  
electrostatic effect ..... B03C

###### Apparatus

General operations ..... B01D  
by centrifugal force ..... B01D  
using centrifuges or  
free-vortex apparatus ..... B04B,  
B04C  
using magnetic or  
electrostatic effect ..... B03C

##### SOLID/SOLID SEPARATION

###### Method

###### Dry methods

material in bulk ..... B07B  
Individual sorting ..... B07C  
Screening, sifting,  
pneumatic sorting ..... B07B  
using pneumatic  
tables or jigs ..... B03B  
by magnetic or  
electrostatic effect ..... B03C  
by centrifugal force ..... B07B  
using centrifuges  
or free-vortex  
apparatus ..... B07B

###### Wet methods

General operations ..... B03B

flotation, differential sedimentation .....	B03D	by magnetic or electrostatic effect.....	B03C
screening .....	B07B	by centrifugal force .....	B07B
Combinations Dry methods - wet methods .....	B03B	using centrifuges or free-vortex apparatus .....	B04B, B04C
Apparatus			
Dry methods		Wet methods	
material in bulk .....	B07B	General operations.....	B03B
Individual sorting .....	B07C	flotation, differential sedimentation.....	B03D
Screening, sifting, pneumatic sorting .....	B07B	screening .....	B07B
using pneumatic tables or jigs .....	B03B	Combinations Dry methods - wet methods .....	B03B

**B01 PHYSICAL OR CHEMICAL PROCESSES OR APPARATUS IN GENERAL** (furnaces, kilns, ovens, retorts, in general F27)

**B01B BOILING; BOILING APPARATUS**

1/00	<b>Boiling; Boiling apparatus for physical or chemical purposes</b> (preparation of starch C08B 30/00; sugar industry C13; steam generation F22; domestic boilers F24) [2]	1/04	. . . by chemical means
		1/06	. Preventing bumping
		1/08	. Boiling apparatus provided with reflux condenser
1/02	. Preventing foaming (in general B01D 19/02)		

**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, vortex apparatus B04; presses *per se* for squeezing-out liquid from liquid-containing material B30B 9/02; treatment of water C02F, e.g. softening by ion-exchange C02F 1/42; arrangement or mounting of filters in air-conditioning, air-humidification or ventilation F24F 13/28) [5]

## Notes

- (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;
  - “filter medium” is a porous material or porous arrangement of material used to filter solids from fluids; [5]
  - “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; [5]
  - “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; [5]
  - “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; [5]
  - “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. [5]
- (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	TREATING LIQUIDS: DISPLACEMENT, ADSORPTION, SEPARATION, DEGASIFICATION, CHROMATOGRAPHY .....	12/00, 15/00, 17/00, 19/00
COLD TRAPS, COLD BAFFLES .....	8/00	TREATING GASES OR VAPOURS: SEPARATION, RECOVERING, CHEMICAL OR BIOLOGICAL PURIFICATION OF WASTE GASES .....	53/00
CRYSTALLISATION .....	9/00		
SOLVENT EXTRACTION .....	11/00		

SEPARATION OF SUSPENDED PARTICLES  
FROM LIQUIDS

By sedimentation .....	21/00
By filtration	
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
filtering devices .....	35/00
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
SEPARATION OF ISOTOPES .....	59/00
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 to 71/00

**1/00 Evaporating** (removal of incrustation B08B;  
preparation of starch C08B 30/00; sugar industry C13;  
prevention of incrustation C23F; drying solid materials  
or objects by evaporating liquids therefrom F26)

- 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 (in general B05B)
- 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** (gas chromatography B01D 15/08;  
destructive distillation C10B; preparation of alcoholic  
beverages by distillation C12G 3/12) [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 (packing elements B01J 19/30,  
B01J 19/32)
- 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** (pumps for evacuating by  
condensing or freezing F04B 37/08) [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** (using liquid sorbents  
B01D 11/00; ion exchange processes or materials,  
sorbent materials in general B01J, e.g. sorbents for  
chromatography B01J 20/281; for investigating or  
analysing materials G01N 30/00); **Apparatus  
therefor** [4]

- 15/02 . with moving adsorbents

## B01D

- 15/04 . with ion-exchange materials as adsorbents (B01D 15/36 takes precedence) [1,8]
- 15/08 . Selective adsorption, e.g. chromatography

### Note

*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. [8]*

- 15/10 . . characterised by constructional or operational features [8]
- 15/12 . . . relating to the preparation of the feed [8]
- 15/14 . . . relating to the introduction of the feed to the apparatus [8]
- 15/16 . . . relating to the conditioning of the fluid carrier [8]
- 15/18 . . . relating to flow patterns [8]
- 15/20 . . . relating to the conditioning of the sorbent material [8]
- 15/22 . . . relating to the construction of the column [8]
- 15/24 . . . relating to the treatment of the fractions to be distributed [8]
- 15/26 . . characterised by the separation mechanism [8]
- 15/30 . . . Partition chromatography [8]
- 15/32 . . . Bonded phase chromatography, e.g. with normal bonded phase, reversed phase or hydrophobic interaction [8]
- 15/34 . . . Size-selective separation, e.g. size-exclusion chromatography; Gel filtration; Permeation [8]
- 15/36 . . . involving ionic interaction, e.g. ion-exchange, ion-pair, ion-suppression or ion-exclusion [8]
- 15/38 . . . involving specific interaction not covered by one or more of groups B01D 15/30 to B01D 15/36, e.g. affinity, ligand exchange or chiral chromatography [8]
- 15/40 . . . using supercritical fluid as mobile phase or eluent [8]
- 15/42 . . characterised by the development mode, e.g. by displacement or by elution [8]
- 17/00 Separation of liquids, not provided for elsewhere, e.g. by thermal diffusion** (devices for separating or removing fatty or oily substances or similar floating material from water, waste water, or sewage C02F 1/40; cleaning or keeping clear the surface of open water from oil or like materials E02B 15/04; arrangements for separating lubricants from refrigerants F25B 43/02)
  - 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 (during boiling B01B 1/02; during fermentation C12)
  - 19/04 . . by addition of chemical substances
- 21/00 Separation of suspended solid particles from liquids by sedimentation** (differential sedimentation B03D 3/00; devices for separating or removing fatty or oily substances or similar floating material from water, waste water, or sewage C02F 1/40)
  - 21/01 . using flocculating agents (for purifying water C02F 1/52; for liquid radioactive waste G21F 9/10) [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 (centrifuges B04B; cyclones B04C)
  - 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** (blood or infusion liquid filters A61M 5/165; screens or sieves per se B07B 1/00; extrusion filters B29C 47/68; filtering spinning solution or melt D01D 1/10; filtration of lubricants F16N 39/06) [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 Other filters with filtering elements stationary during filtration, e.g. pressure or suction filters, or 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

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. [5]

- 29/085 . Funnel filters; Holders therefor [5]

#### Note

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. [5]

- 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]

## B01D

- 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 to B01D 24/36; centrifuges B04B) [5]
- 33/01 . with translationally moving filtering elements, e.g. pistons (B01D 33/04 to 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; presses *per se* for squeezing out liquid using an endless pressing band B30B 9/24) [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 Other filtering devices; 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; electro dialysis, electro-osmosis B01D 61/42; devices comprising 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 (preventing or minimising fires or explosions A62C); 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) [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 (making filter paper D21F 11/14)
- 39/20 . . of inorganic material, e.g. asbestos paper, metallic filtering material of non-woven wires (porous ceramic material C04B; sintering metals C22C 1/04)
- 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

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- 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** (suction cleaner filters A47L 9/10; filters for breathing-protection purposes A62B 23/00; filtering air for vehicles B60H 3/06; separating pneumatically-conveyed materials from propelling gas B65G 53/60; exhaust or silencing apparatus for machines or engines having means for removing solid constituents of exhaust F01N 3/02; air cleaners for the intakes of gas-turbine or jet-propulsion plants F02C 7/05, of combustion engines F02M 35/024, of compressors F04B 39/16; filtering in air-conditioning F24F 3/16)
- 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 to 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 conveyers
- 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

## B01D

- 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, 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 (packing elements B01J 19/30, B01J 19/32) [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** (preventing dust fires A62C; pretreatment specially adapted for magnetic or electrostatic separation B03C) [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, aerosols** (recovery of volatile solvents by condensation B01D 5/00; sublimation B01D 7/00; cold traps, cold baffles B01D 8/00; for the separation of specific gases or vapours, see the relevant places, e.g. for purification or separation of nitrogen C01B 21/04; working-up undefined gaseous mixtures obtained by cracking hydrocarbon oils C10G 70/00; cleaning coal gas C10K; working-up of natural gas, or synthetic natural gas, C10L 3/10; separation of difficult-to-condense gases or air by liquefaction F25J; for investigating materials G01N 30/00) [3,5]

### Note

Processes using enzymes or micro-organisms in order to:

- (i) liberate, separate or purify a pre-existing compound or composition, or to
- (ii) treat textiles or clean solid surfaces of materials are further classified in subclass C12S. [6]

### Note

Group B01D 53/34 takes precedence over groups B01D 53/02 to 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; packing elements B01J 19/30, B01J 19/32)
- 53/22 . by diffusion (manufacturing semi-permeable membranes B01D 67/00; form, structure or properties of semi-permeable membranes B01D 69/00; material for semi-permeable membranes B01D 71/00)
- 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 to 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 (treatment of water, waste water, sewage or sludge by electrophoresis C02F 1/469; electrophoretic production of compounds or non-metals C25B 7/00; investigating or analysing materials by using electrophoresis G01N 27/26) [3,5]
- 59/00 Separation of different isotopes of the same chemical element** (preventing occurrence of critical conditions when producing fissile material G21; shielding from radioactivity G21F)
- 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 (in general B01J)
- 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, ultrafiltration; Apparatus specially adapted therefor; Semi-permeable membranes or their production** (separation of gases or vapours by diffusion B01D 53/22; treatment of milk by dialysis, reverse osmosis or ultrafiltration A23C 9/142, by electrodialysis A23C 9/144; artificial kidneys A61M 1/14; treatment of water by dialysis, osmosis or reverse osmosis C02F 1/44, by electrodialysis C02F 1/469; apparatus for enzymology or microbiology with dialysis means C12M 1/12; production or purification of sugar juices, e.g. by osmosis, C13D 3/16; extraction of sugar from molasses, e.g. by osmosis, C13J 1/08; diaphragms for electrolysis C25B 13/00, C25C 7/04; osmosis as energy source F03G 7/00) [5]
- Note**
- In groups B01D 61/00 to B01D 71/00, in the absence of an indication to the contrary, classification is made in the last appropriate place (in respect of group B01D 71/00, see also Note (1) following that group). [5]
- 61/00 Processes of separation using semi-permeable membranes, e.g. dialysis, osmosis, ultrafiltration; Apparatus, accessories or auxiliary operations specially adapted therefor [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]**

**Notes**

- (1) In this group, the following term is used with the meaning indicated:  
– “properties” covers those of a mechanical, physical or chemical nature. [5]
- (2) Manufacturing processes, if considered of interest, are also classified in group B01D 67/00. [5]

- 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]**

**Notes**

- (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. [5]
- (2) Manufacturing processes, if considered of interest, are also classified in group B01D 67/00. [5]

- 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**

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). [5]

- 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 to 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]	71/72	. . . 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 to B01D 71/70 [5]
71/60	. . . Polyamines [5]	71/74	. . . Natural macromolecular material or derivatives thereof (B01D 71/08, B01D 71/24 take precedence) [5]
71/62	. . . Polycondensates having nitrogen-containing heterocyclic rings in the main chain [5]	71/76	. . . Macromolecular material not specifically provided for in a single one of groups B01D 71/08 to B01D 71/74 (rubbers in general B01D 71/24) [5]
71/64	. . . Polyimides; Polyamide-imides; Polyester-imides; Polyamide acids or similar polyimide precursors [5]	71/78	. . . Graft polymers [5]
71/66	. . . Polymers having sulfur in the main chain, with or without nitrogen, oxygen or carbon only [5]	71/80	. . . Block polymers [5]
71/68	. . . Polysulfones; Polyethersulfones [5]	71/82	. . . characterised by the presence of specified groups, e.g. introduced by chemical after-treatment [5]
71/70	. . . Polymers having silicon in the main chain, with or without sulfur, nitrogen, oxygen or carbon only [5]		

## B01F MIXING, E.G. DISSOLVING, EMULSIFYING, DISPERSING (mixing paints B44D 3/06)

### Note

In this subclass, the following term or expression is used with the meaning indicated:

- “mixing” covers stirring of a single material. [2]

### Subclass Index

DISSOLVING .....	1/00	with rotary action.....	7/00, 9/00
MIXING, DISPERSING, EMULSIFYING		other mixers .....	11/00, 13/00
Processes .....	3/00	accessories .....	15/00
Apparatus		EMULSIFYING OR DISPERSING AGENTS .....	17/00
flow mixers .....	5/00		

<b>1/00</b>	<b>Dissolving</b> (separating by dissolving B01D; dissolving to effect cooling F25D 5/00) [2]	5/14	. . . of the gear type
<b>3/00</b>	<b>Mixing, e.g. dispersing, emulsifying, according to the phases to be mixed</b>	5/16	. . . Turbo-mixers
3/02	. gases with gases or vapours	5/18	. . . Spray-mixers
3/04	. gases or vapours with liquids (mixing non-alcoholic beverages with gases A23L 2/54)	5/20	. . . with nozzles
3/06	. gases or vapours with solids	5/22	. . . with rotary discs
3/08	. liquids with liquids; Emulsifying	5/24	. Falling particle mixers with repeated action
3/10	. . . Mixing very viscous liquids	5/26	. Falling particle mixers with moving means, e.g. stirrers for increasing the mixing
3/12	. liquids with solids (displacing one liquid by another in dispersions of solids in liquids B01D 12/00)	<b>7/00</b>	<b>Mixers with rotary stirring devices in fixed receptacles; Kneaders</b> (B01F 13/04 takes precedence)
3/14	. . . Mixing very viscous liquids with solids	7/02	. with stirrers rotating about a horizontal or inclined axis
3/18	. solid with solids	7/04	. . . with paddles or arms
3/20	. Pretreatment of the materials to be mixed	7/06	. . . with propellers
3/22	. Aftertreatment of the mixture	7/08	. . . with helices
<b>Mixers</b>		7/10	. . . with rotary discs
<b>5/00</b>	<b>Flow mixers</b> (sprayers, atomisers B05B); <b>Mixers for falling materials, e.g. solid particles</b> (B01F 13/04 takes precedence; centrifugal mixers B04)	7/12	. . . with cylinders
5/02	. Jet mixers	7/14	. . . with stirrers having planetary motion
5/04	. Injector mixers	7/16	. with stirrers rotating about a vertical axis
5/06	. Mixers in which the components are pressed together through slits, orifices, or screens (turbo-mixers B01F 5/16; colloid-mills B02C; mixing valves F16K 11/00)	7/18	. . . with paddles or arms
5/08	. . . Homogenising or emulsifying nozzles	7/20	. . . with fixed axis
5/10	. Circulation mixers	7/22	. . . with propellers
5/12	. Pump mixers	7/24	. . . with helices
		7/26	. . . with rotary discs
		7/28	. . . with cylinders
		7/30	. . . with stirrers having planetary motion
		7/32	. . . with openwork frames or cages

<b>9/00</b>	<b>Mixers with rotating receptacles</b> (B01F 13/04 takes precedence)	<b>17/04</b>	• Sulfonates or sulfuric acid ester salts derived from polyhydric alcohols or amino alcohols or derivatives thereof (sulfated or sulfonated fatty oils B01F 17/08)
<b>9/02</b>	• rotating about a horizontal or inclined axis, e.g. drum mixers	<b>17/06</b>	• Esters of higher fatty acids with hydroxyalkylated sulfonic acids or salts thereof
<b>9/04</b>	• . without bars	<b>17/08</b>	• Sulfation or sulfonation products of fats, oils, waxes, or higher fatty acids or esters thereof with monovalent alcohols
<b>9/06</b>	• . with fixed bars	<b>17/10</b>	• Derivatives of low-molecular-weight sulfocarboxylic acids or sulfopolycarboxylic acids
<b>9/08</b>	• . with rotating stirring devices	<b>17/12</b>	• Sulfonates of aromatic or alkylated aromatic compounds
<b>9/10</b>	• rotating about a vertical axis	<b>17/14</b>	• Derivatives of phosphoric acid
<b>9/12</b>	• . with paddles or arms	<b>17/16</b>	• Amines or polyamines
<b>9/14</b>	• . with propellers	<b>17/18</b>	• Quaternary ammonium compounds
<b>9/16</b>	• . with helices	<b>17/20</b>	• Phosphonium and sulfonium compounds
<b>9/18</b>	• . with rotary discs	<b>17/22</b>	• Amides or hydrazides
<b>9/20</b>	• . with cylinders	<b>17/24</b>	• . Amides of higher fatty acids with aminoalkylated sulfonic acids
<b>9/22</b>	• with stirrers having planetary motion	<b>17/26</b>	• Sulfonamides
<b>11/00</b>	<b>Mixers with shaking, oscillating, or vibrating mechanisms</b> (B01F 13/04 takes precedence)	<b>17/28</b>	• Aminocarboxylic acids (protein hydrolysates B01F 17/30)
<b>11/02</b>	• Mixing by means of ultrasonic vibrations	<b>17/30</b>	• Proteins; Protein hydrolysates
<b>11/04</b>	• with pendulum stirrers	<b>17/32</b>	• Heterocyclic compounds
<b>13/00</b>	<b>Other mixers; Mixing plant, including combinations of dissimilar mixers</b>	<b>17/34</b>	• Higher-molecular-weight carboxylic acid esters (B01F 17/06 takes precedence)
<b>13/02</b>	• Mixers with gas agitation, e.g. with air supply tubes	<b>17/36</b>	• . Esters of polycarboxylic acids
<b>13/04</b>	• Mixers combined with safety devices	<b>17/38</b>	• Alcohols, e.g. oxidation products of paraffins
<b>13/06</b>	• Mixers adapted for working at sub- or super-atmospheric pressure	<b>17/40</b>	• Phenols
<b>13/08</b>	• Magnetic mixers	<b>17/42</b>	• Ethers, e.g. polyglycol ethers of alcohols or phenols
<b>13/10</b>	• Mixing plant, including combinations of dissimilar mixers	<b>17/44</b>	• . Ether carboxylic acids
<b>15/00</b>	<b>Accessories for mixers</b>	<b>17/46</b>	• . Ethers of aminoalcohols
<b>15/02</b>	• Feed or discharge mechanisms	<b>17/48</b>	• . Cellulose ethers
<b>15/04</b>	• 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)	<b>17/50</b>	• Derivatives of lignin
<b>15/06</b>	• Heating or cooling systems	<b>17/52</b>	• Natural or synthetic resins or their salts
<b>17/00</b>	<b>Use of substances as emulsifying, wetting, dispersing, or foam-producing agents</b> (flotation agents B03D 1/001; used for particular applications, <u>see</u> the relevant classes, e.g. use of substances as detergents C11D) [3,5]	<b>17/54</b>	• Silicon compounds
<b>17/02</b>	• Alkyl sulfonates or sulfuric acid ester salts derived from monohydric alcohols	<b>17/56</b>	• Glucosides; Mucilage; Saponines

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

**Notes**

- (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; [2]
  - “fluidised particles” means finely divided solid particles lifted and agitated by a stream of fluid; [2]
  - “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”; [2]
  - “processes conducted in the presence of solid particles” does not include processes wherein the only solid particles present are formed during the reaction. [3]
- (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. [6]

**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 to 37/00
Regeneration or reactivation of catalysts, in general.....	38/00
SORBENT, FILTER AID COMPOSITIONS .....	20/00
ION EXCHANGE PROCESSES.....	39/00 to 49/00
COLLOID CHEMISTRY .....	13/00
GRANULATION.....	2/00

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

- 2/02 . by dividing the liquid material into drops, e.g. by spraying, and solidifying the drops (evaporating by spraying B01D 1/16)
- 2/04 . . . in a gaseous medium
- 2/06 . . . in a liquid medium
- 2/08 . . . . Gelation of a colloidal solution
- 2/10 . in stationary drums or troughs, provided with kneading or mixing appliances
- 2/12 . in rotating drums
- 2/14 . in rotating dishes or pans
- 2/16 . by suspending the powder material in a gas, e.g. in fluidised beds or as a falling curtain
- 2/18 . using a vibrating apparatus
- 2/20 . by expressing the material, e.g. through sieves and fragmenting the extruded length
- 2/22 . by pressing in moulds or between rollers
- 2/24 . Obtaining flakes by scraping a solid layer from a surface
- 2/26 . on endless conveyer belts
- 2/28 . using special binding agents
- 2/30 . using agents to prevent the granules sticking together; Rendering particulate materials free flowing in general, e.g. making them hydrophobic [4]

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

- 3/02 . Feed or outlet devices therefor
- 3/03 . Pressure vessels, or vacuum vessels, having closure members or seals specially adapted therefor [3]
- 3/04 . Pressure vessels, e.g. autoclaves [2]

- 3/06 . Processes using ultra-high pressure, e.g. for the formation of diamonds; Apparatus therefor, e.g. moulds, dies (B01J 3/04 takes precedence; presses in general B30B) [2]
- 3/08 . . . Application of shock waves for chemical reactions or for modifying the crystal structure of substances (blasting F42D) [3]

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

- 4/02 . for feeding measured quantities of reagents
- 4/04 . using osmotic pressure [4]

**6/00 Calcining; Fusing**

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

- 7/02 . by wet methods

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

- 8/02 . with stationary particles, e.g. in fixed beds [2]
- 8/04 . . . the fluid passing successively through two or more beds [2]
- 8/06 . . . in tube reactors; the solid particles being arranged in tubes [2]
- 8/08 . with moving particles (with fluidised particles B01J 8/18) [2]
- 8/10 . . . moved by stirrers or by rotary drums or rotary receptacles [2]
- 8/12 . . . moved by gravity in a downward flow [2]
- 8/14 . . . moving in free vortex flow apparatus (free vortex flow apparatus in general B04C) [2]
- 8/16 . with particles being subjected to vibrations or pulsations (B01J 8/40 takes precedence) [2]
- 8/18 . with fluidised particles [2]
- 8/20 . . . with liquid as a fluidising medium [2]
- 8/22 . . . . gas being introduced into the liquid [2]
- 8/24 . . . according to "fluidised-bed" technique (B01J 8/20 takes precedence; combustion apparatus in which combustion takes place in a fluidised bed of fuel or other particles F23C 10/00) [2]
- 8/26 . . . . with two or more fluidised beds, e.g. reactor and regeneration installations [2]
- 8/28 . . . . . the one above the other [2]
- 8/30 . . . . . the edge of a lower bed projecting beyond the edge of the superjacent bed [2]

- 8/32 . . . with introduction into the fluidised bed of more than one kind of moving particles [2]
- 8/34 . . . with stationary packing material in the fluidised bed, e.g. bricks, wire rings, baffles [2]
- 8/36 . . . with fluidised bed through which there is an essentially horizontal flow of particles [2]
- 8/38 . . . with fluidised bed containing a rotatable device or being subject to rotation [2]
- 8/40 . . . with fluidised bed subjected to vibrations or pulsations [2]
- 8/42 . . . with fluidised bed subjected to electric current or to radiations [2]
- 8/44 . . . Fluidisation grids [2]
- 8/46 . . . for treatment of endless filamentary, band or sheet material [2]

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

- 10/02 . of the thin-film type [3]

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

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

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

- 13/02 . Making microcapsules or microballoons
- 13/04 . . by physical processes, e.g. drying, spraying [5]
- 13/06 . . by phase separation [5]
- 13/08 . . . Simple coacervation, i.e. addition of highly hydrophilic material [5]
- 13/10 . . . Complex coacervation, i.e. interaction of oppositely charged particles [5]
- 13/12 . . . removing solvent from the wall-forming material solution [5]
- 13/14 . . . Polymerisation, crosslinking [5]
- 13/16 . . . . Interfacial polymerisation [5]
- 13/18 . . . . In situ polymerisation with all reactants being present in the same phase [5]
- 13/20 . . After-treatment of capsule walls, e.g. hardening [5]
- 13/22 . . . Coating [5]

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

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

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

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

- 19/02 . Apparatus characterised by being constructed of material selected for its chemically-resistant properties (refractory details of furnaces F27D) [3]
- 19/06 . Solidifying liquids (making micro-capsules B01J 13/02) [3]
- 19/08 . Processes employing the direct application of electric or wave energy, or particle radiation; Apparatus therefor (application of shock waves B01J 3/08; generating or handling plasma H05H 1/00) [3]
- 19/10 . . employing sonic or ultrasonic vibrations (for auxiliary pretreatment of gases or vapours to be cleaned B01D 51/08; for cleaning B08B 3/12) [3]
- 19/12 . . employing electromagnetic waves [3]
- 19/14 . Production of inert gas mixtures; Use of inert gases in general (apparatus for generating gases B01J 7/00; separation of gases or vapours B01D 53/00) [3]
- 19/16 . Preventing evaporation or oxidation of non-metallic liquids by applying a floating layer, e.g. of micro-balloons [3]
- 19/18 . Stationary reactors having moving elements inside (B01J 19/08, B01J 19/26 take precedence) [3]
- 19/20 . . in the form of helices, e.g. screw reactors (thin-film reactors B01J 10/02) [3]
- 19/22 . . in the form of endless belts [3]
- 19/24 . Stationary reactors without moving elements inside (B01J 19/08, B01J 19/26 take precedence; with stationary particles B01J 8/02) [3]
- 19/26 . Nozzle-type reactors, i.e. the distribution of the initial reactants within the reactor is effected by their introduction or injection through nozzles [3]
- 19/28 . Moving reactors, e.g. rotary drums (B01J 19/08 takes precedence; centrifuges B04B; rotary drum furnaces F27B 7/00) [3]
- 19/30 . Loose or shaped packing elements, e.g. Raschig rings or Berl saddles, for pouring into the apparatus for mass or heat transfer [5]
- 19/32 . Packing elements in the form of grids or built-up elements for forming a unit or module inside the apparatus for mass or heat transfer [5]

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

#### Notes

- (1) In groups B01J 20/00 to 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. [2,5]
- (2) Attention is drawn to the definitions of groups of chemical elements following the title of section C. [2]
- (3) In group B01J 20/00 and in each set of groups B01J 21/00 to B01J 31/00 and B01J 32/00 to B01J 38/00, in the absence of an indication to the contrary, classification is made in the last appropriate place. [2,5]

- (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. [2]

**20/00** *Solid sorbent compositions or filter aid compositions; Sorbents for chromatography; Processes for preparing, regenerating or reactivating thereof (use of solid sorbent compositions in liquid separation B01D 15/00; use of filter aid compositions B01D 37/02; use of sorbent compositions in gas separation B01D 53/02, B01D 53/14) [3,8]*

- 20/02 . comprising inorganic material [3]
- 20/04 . . comprising compounds of alkali metals, alkaline earth metals or magnesium [3]
- 20/06 . . comprising oxides or hydroxides of metals not provided for in group B01J 20/04 [3]
- 20/08 . . . comprising aluminium oxide or hydroxide; comprising bauxite [3]
- 20/10 . . comprising silica or silicate [3]
- 20/12 . . . Naturally occurring clays or bleaching earth [3]
- 20/14 . . . Diatomaceous earth [3]
- 20/16 . . . Alumino-silicates (B01J 20/12 takes precedence) [3]
- 20/18 . . . . Synthetic zeolitic molecular sieves [3]
- 20/20 . . comprising free carbon; comprising carbon obtained by carbonising processes (active carbon C01B 31/08) [3]
- 20/22 . comprising organic material [3]
- 20/24 . . Naturally occurring macromolecular compounds, e.g. humic acids or their derivatives [3]
- 20/26 . . Synthetic macromolecular compounds [3]
- 20/28 . characterised by their form or physical properties [3]
- 20/281 . *Sorbents specially adapted for preparative, analytical or investigative chromatography [8]*
- 20/282 . . *Porous sorbents (ion exchange B01J 39/00 to B01J 41/00) [8]*
- 20/283 . . . based on silica [8]
- 20/284 . . . based on alumina [8]
- 20/285 . . . based on polymers [8]
- 20/286 . . *Phases chemically bonded to a substrate, e.g. to silica or to polymers [8]*
- 20/287 . . . *Non-polar phases; Reversed phases [8]*
- 20/288 . . . *Polar phases [8]*
- 20/289 . . . *bonded via a spacer [8]*
- 20/29 . . *Chiral phases [8]*
- 20/291 . . *Gel sorbents [8]*
- 20/292 . . *Liquid sorbents [8]*
- 20/30 . Processes for preparing, regenerating or reactivating [3]
- 20/32 . . Impregnating or coating [3]
- 20/34 . . Regenerating or reactivating [3]

## Notes

- (1) In groups B01J 21/00 to B01J 38/00, the following term is used with the meaning indicated:
- “catalyst” covers also a carrier forming part of the catalyst. [2,5]
- (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 to 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. [4,5]

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

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

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

- 23/02 . of the alkali- or alkaline earth metals or beryllium [2]
- 23/04 . . Alkali metals [2]
- 23/06 . of zinc, cadmium or mercury [2]
- 23/08 . of gallium, indium or thallium [2]
- 23/10 . of rare earths [2]
- 23/12 . of actinides [2]
- 23/14 . of germanium, tin or lead [2]
- 23/16 . of arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium [2]
- 23/18 . . Arsenic, antimony or bismuth [2]
- 23/20 . . Vanadium, niobium or tantalum [2]
- 23/22 . . . Vanadium [2]
- 23/24 . . Chromium, molybdenum or tungsten [2]
- 23/26 . . . Chromium [2]
- 23/28 . . . Molybdenum [2]
- 23/30 . . . Tungsten [2]
- 23/31 . . . combined with bismuth [3]
- 23/32 . . Manganese, technetium or rhenium [2]
- 23/34 . . . Manganese [2]
- 23/36 . . . Rhenium [2]
- 23/38 . of noble metals [2]
- 23/40 . . of the platinum group metals [2]
- 23/42 . . . Platinum [2]
- 23/44 . . . Palladium [2]
- 23/46 . . . Ruthenium, rhodium, osmium or iridium [2]
- 23/48 . . Silver or gold [2]
- 23/50 . . . Silver [2]
- 23/52 . . . Gold [2]
- 23/54 . . combined with metals, oxides or hydroxides provided for in groups B01J 23/02 to B01J 23/36 [2]
- 23/56 . . . Platinum group metals [2]
- 23/58 . . . . with alkali- or alkaline earth metals or beryllium [2,6]

**B01J**

23/60	. . . .	with zinc, cadmium or mercury [2]
23/62	. . . .	with gallium, indium, thallium, germanium, tin or lead [2]
23/63	. . . .	with rare earths or actinides [6]
23/64	. . . .	with arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium [2]
23/644	. . . . .	Arsenic, antimony or bismuth [6]
23/648	. . . . .	Vanadium, niobium or tantalum [6]
23/652	. . . . .	Chromium, molybdenum or tungsten [6]
23/656	. . . . .	Manganese, technetium or rhenium [6]
23/66	. . . .	Silver or gold [2]
23/68	. . . .	with arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium [2]
23/70	. . . .	of the iron group metals or copper [2]
23/72	. . . .	Copper [2]
23/74	. . . .	Iron group metals [2]
23/745	. . . .	Iron [6]
23/75	. . . .	Cobalt [6]
23/755	. . . .	Nickel [6]
23/76	. . . .	combined with metals, oxides or hydroxides provided for in groups B01J 23/02 to B01J 23/36 [2]
23/78	. . . .	with alkali- or alkaline earth metals or beryllium [2,6]
23/80	. . . .	with zinc, cadmium or mercury [2]
23/825	. . . .	with gallium, indium or thallium [6]
23/83	. . . .	with rare earths or actinides [6]
23/835	. . . .	with germanium, tin or lead [6]
23/84	. . . .	with arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium [2]
23/843	. . . . .	Arsenic, antimony or bismuth [6]
23/847	. . . . .	Vanadium, niobium or tantalum [6]
23/85	. . . . .	Chromium, molybdenum, or tungsten [3]
23/86	. . . . .	Chromium [2,3]
23/88	. . . . .	Molybdenum [2,3]
23/881	. . . . .	and iron [6]
23/882	. . . . .	and cobalt [6]
23/883	. . . . .	and nickel [6]
23/885	. . . . .	and copper [6]
23/887	. . . . .	containing in addition other metals, oxides or hydroxides provided for in groups B01J 23/02 to B01J 23/36 [6]
23/888	. . . . .	Tungsten [6]
23/889	. . . . .	Manganese, technetium or rhenium [6]
23/89	. . . . .	combined with noble metals [3]
23/90	. . . . .	Regeneration or reactivation [2]
23/92	. . . . .	of catalysts comprising metals, oxides or hydroxides provided for in groups B01J 23/02 to B01J 23/36 [2]
23/94	. . . . .	of catalysts comprising metals, oxides or hydroxides of the iron group metals or copper [2]
23/96	. . . . .	of catalysts comprising metals, oxides or hydroxides of the noble metals [2]
25/00	<b>Catalysts of the Raney type [2]</b>	
25/02	. . . . .	Raney nickel [2]
25/04	. . . . .	Regeneration or reactivation [2]

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

**Note**

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. [2,5]

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



- 27/236 . . . Hydroxy carbonates [4]
- 27/24 . Nitrogen compounds [2]
- 27/25 . . Nitrates [4]
- 27/26 . . Cyanides [2]
- 27/28 . Regeneration or reactivation [2]
- 27/30 . . of catalysts comprising compounds of sulfur, selenium or tellurium [2]
- 27/32 . . of catalysts comprising compounds of halogens [2]

## 29/00 Catalysts comprising molecular sieves [2]

### Note

In this group, the following term is used with the meaning indicated: [6]

– “zeolites” means: [6]

- (i) crystalline aluminosilicates with base-exchange and molecular sieve properties, having three dimensional, microporous lattice framework structure of tetrahedral oxide units; [6]
- (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. [6]

- 29/03 . not having base-exchange properties [6]
- 29/035 . . Crystalline silica polymorphs, e.g. silicalites [6]
- 29/04 . having base-exchange properties, e.g. crystalline zeolites, pillared clays [2,6]
- 29/06 . . Crystalline aluminosilicate zeolites; Isomorphous compounds thereof [2]
- 29/064 . . . containing iron group metals, noble metals or copper [6]
- 29/068 . . . . Noble metals [6]
- 29/072 . . . . Iron group metals or copper [6]
- 29/076 . . . containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium [6]
- 29/08 . . . of the faujasite type, e.g. type X or Y [2]
- 29/10 . . . . containing iron group metals, noble metals or copper [2]
- 29/12 . . . . . Noble metals [2]
- 29/14 . . . . . Iron group metals or copper [2]
- 29/16 . . . . containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium [2]
- 29/18 . . . of the mordenite type [2]
- 29/20 . . . . containing iron group metals, noble metals or copper [2]
- 29/22 . . . . . Noble metals [2]
- 29/24 . . . . . Iron group metals or copper [2]
- 29/26 . . . . containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium [2]
- 29/40 . . . of the pentasil type, e.g. types ZSM-5, ZSM-8 or ZSM-11, as exemplified by patent documents US A 3,702,886, GB A 1,334,243 and US A 3,709,979, respectively [6]
- 29/42 . . . . containing iron group metals, noble metals or copper [6]
- 29/44 . . . . . Noble metals [6]
- 29/46 . . . . . Iron group metals or copper [6]

- 29/48 . . . . containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium [6]
- 29/50 . . . of the erionite or offretite type, e.g. zeolite T, as exemplified by patent document US A 2,950,952 [6]
- 29/52 . . . . containing iron group metals, noble metals or copper [6]
- 29/54 . . . . . Noble metals [6]
- 29/56 . . . . . Iron group metals or copper [6]
- 29/58 . . . . containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium [6]
- 29/60 . . . of the type L, as exemplified by patent document US A 3,216,789 [6]
- 29/61 . . . . containing iron group metals, noble metals or copper [6]
- 29/62 . . . . . Noble metals [6]
- 29/63 . . . . . Iron group metals or copper [6]
- 29/64 . . . . containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium [6]
- 29/65 . . . of the ferrierite type, e.g. types ZSM-21, ZSM-35 or ZSM-38, as exemplified by patent documents US A 4,046,859, US A 4,016,245 and US A 4,046,859, respectively [6]
- 29/66 . . . . containing iron group metals, noble metals or copper [6]
- 29/67 . . . . . Noble metals [6]
- 29/68 . . . . . Iron group metals or copper [6]
- 29/69 . . . . containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium [6]
- 29/70 . . . of types characterised by their specific structure not provided for in groups B01J 29/08 to B01J 29/65 [6]
- 29/72 . . . . containing iron group metals, noble metals or copper [6]
- 29/74 . . . . . Noble metals [6]
- 29/76 . . . . . Iron group metals or copper [6]
- 29/78 . . . . containing arsenic, antimony, bismuth, vanadium, niobium, tantalum, polonium, chromium, molybdenum, tungsten, manganese, technetium or rhenium [6]
- 29/80 . . . Mixtures of different zeolites [6]
- 29/82 . Phosphates [6]
- 29/83 . . Aluminophosphates (APO compounds) [6]
- 29/84 . . Aluminophosphates containing other elements, e.g. metals, boron [6]
- 29/85 . . . Silicoaluminophosphates (SAPO compounds) [6]
- 29/86 . Borosilicates; Aluminoborosilicates [6]
- 29/87 . Gallosilicates; Aluminogallosilicates; Galloborosilicates [6]
- 29/88 . Ferrosilicates; Ferroaluminosilicates [6]
- 29/89 . Silicates, aluminosilicates or borosilicates of titanium, zirconium or hafnium [6]
- 29/90 . Regeneration or reactivation [6]

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

### Note

In this group, the presence of water is disregarded for classification purposes. [2]

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

### Notes

- (1) *When classifying in groups B01J 32/00 to 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 to B01J 31/00. Such a part of a catalyst can be either a single substance or a composition in itself. [6,8]*
- (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". [8]*

- 32/00 Catalyst carriers in general [4]**

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

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

- 35/02 . Solids [2]
- 35/04 . . Foraminous structures, sieves, grids, honeycombs [2]
- 35/06 . . Fabrics or filaments [2]
- 35/08 . . Spheres [2]

- 35/10 . . characterised by their surface properties or porosity [2]

- 35/12 . Liquids or melts [2]

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

- 37/02 . Impregnation, coating or precipitation (protecting by coating B01J 33/00) [2]
- 37/025 . . using a distinct intermediate layer, e.g. substrate-support-active layer [6]
- 37/03 . . Precipitation; Co-precipitation [4]
- 37/04 . Mixing [2]
- 37/06 . Washing [2]
- 37/08 . Heat treatment [2]
- 37/10 . . in the presence of water, e.g. steam [2]
- 37/12 . Oxidising [2]
- 37/14 . . with gases containing free oxygen [2]
- 37/16 . Reducing [2]
- 37/18 . . with gases containing free hydrogen [2]
- 37/20 . Sulfiding [2]
- 37/22 . Halogenating [2]
- 37/24 . . Chlorinating [2]
- 37/26 . . Fluorinating [2]
- 37/28 . Phosphorising [2]
- 37/30 . Ion-exchange [2]
- 37/32 . Freeze drying, i.e. lyophilisation [2]
- 37/34 . Irradiation by, or application of, electric, magnetic or wave energy, e.g. ultrasonic waves [2]
- 37/36 . Biochemical methods [2]

- 38/00 Regeneration or reactivation of catalysts, in general [4]**

- 38/02 . Heat treatment [4]
- 38/04 . Gas or vapour treating; Treating by using liquids vaporisable upon contacting spent catalyst [4]
- 38/06 . . using steam [4]
- 38/08 . . using ammonia or derivatives thereof [4]
- 38/10 . . using elemental hydrogen [4]
- 38/12 . . Treating with free oxygen-containing gas [4]
- 38/14 . . . with control of oxygen content in oxidation gas [4]
- 38/16 . . . Oxidation gas comprising essentially steam and oxygen [4]
- 38/18 . . . with subsequent reactive gas treating [4]
- 38/20 . . . Plural distinct oxidation stages [4]
- 38/22 . . . Moving bed, e.g. vertically or horizontally moving bulk [4]
- 38/24 . . . . having mainly transverse, i.e. lateral, flow of oxygen-containing gas and material [4]
- 38/26 . . . . having mainly counter-current flow of oxygen-containing gas and material [4]
- 38/28 . . . . having mainly concurrent flow of oxygen-containing gas and material [4]
- 38/30 . . . in gaseous suspension, e.g. fluidised bed [4]
- 38/32 . . . . Indirectly heating or cooling material within regeneration zone or prior to entry into regeneration zone [4]
- 38/34 . . . . with plural distinct serial combustion stages [4]
- 38/36 . . . . and with substantially complete oxidation of carbon monoxide to carbon dioxide within regeneration zone [4]
- 38/38 . . . and adding heat by solid heat carrier [4]
- 38/40 . . . and forming useful by-products [4]
- 38/42 . . using halogen-containing material [4]

- 38/44 . . . and adding simultaneously or subsequently free oxygen; using oxyhalogen compound [4]
- 38/46 . . . fluorine-containing [4]
- 38/48 . Liquid treating or treating in liquid phase, e.g. dissolved or suspended [4]
- 38/50 . . using organic liquids [4]
- 38/52 . . . oxygen-containing [4]
- 38/54 . . . halogen-containing [4]
- 38/56 . . . Hydrocarbons [4]
- 38/58 . . . and gas addition thereto [4]
- 38/60 . . using acids [4]
- 38/62 . . . organic [4]
- 38/64 . . using alkaline material; using salts [4]
- 38/66 . . . using ammonia or derivatives thereof [4]
- 38/68 . . including substantial dissolution or chemical precipitation of a catalyst component in the ultimate reconstitution of the catalyst [4]
- 38/70 . . Wet oxidation of material submerged in liquid [4]
- 38/72 . including segregation of diverse particles [4]
- 38/74 . utilising ion-exchange [4]

**Ion-exchange** (treatment of milk A23C 9/14; separation by ion-exchangers B01D, e.g. separation of liquids by ion-exchange adsorbents B01D 15/04, chromatography involving ion-exchange B01D 15/36; separation of isotopes B01D 59/00; compounds per se, see the relevant classes, e.g. C01, C07, C08; treatment of water C02F 1/42; refining of hydrocarbon oils, in the absence of hydrogen, with solid sorbents C10G 25/00; purification of sugar juices C13D 3/14; extraction of sugar from molasses C13J 1/06; extraction of metal compounds from ores or concentrates by wet processes C22B 3/00; using ion-exchange for investigating or analysing materials G01N 30/96; treating radioactively contaminated material G21F 9/12) [3]

#### Notes

- (1) In groups B01J 39/00 to 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; [3]
  - ion-exchange processes cover also ion-exchange in combination with complex or chelate forming reactions. [3]
- (2) In groups B01J 39/00 to B01J 49/00, in the absence of an indication to the contrary, classification is made in the last appropriate place. [3]

**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) [3,8]*

- 39/02 . Processes using inorganic exchangers [3]
- 39/04 . Processes using organic exchangers [3]
- 39/06 (transferred to B01J 39/26)
- 39/08 . Use of material as cation exchangers; Treatment of material for improving the cation exchange properties [3]
- 39/10 . . Oxides or hydroxides [3]
- 39/12 . . Compounds containing phosphorus [3]
- 39/14 . . Base exchange silicates, e.g. zeolites [3]
- 39/16 . . Organic material [3]
- 39/18 . . . Macromolecular compounds [3]

- 39/20 . . . . Macromolecular compounds obtained by reactions only involving unsaturated carbon-to-carbon bonds [3]
- 39/22 . . . . Cellulose or wood; Derivatives thereof [3]
- 39/24 . . Carbon, coal or tar [3]
- 39/26 . Cation exchangers for chromatographic processes [8]
- 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) [3,8]*
- 41/02 . Processes using inorganic exchangers [3]
- 41/04 . Processes using organic exchangers [3]
- 41/06 (transferred to B01J 41/20)
- 41/08 . Use of material as anion exchangers; Treatment of material for improving the anion exchange properties [3]
- 41/10 . . Inorganic material (carbon, coal or tar B01J 41/18) [3]
- 41/12 . . Macromolecular compounds [3]
- 41/14 . . . . Macromolecular compounds obtained by reactions only involving unsaturated carbon-to-carbon bonds [3]
- 41/16 . . . . Cellulose or wood; Derivatives thereof [3]
- 41/18 . . Carbon, coal or tar [3]
- 41/20 . Anion exchangers for chromatographic processes [8]

**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) [3,8]*

**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) [3,8]*

**47/00** *Ion-exchange processes in general; Apparatus therefor (ion-exchange chromatography processes or apparatus B01D 15/08) [3,8]*

- 47/02 . Column or bed processes [3]
- 47/04 . . Mixed-bed processes [3]
- 47/06 . . during which the ion-exchange material is subjected to a physical treatment, e.g. heat, electric current, irradiation, vibration (electrodialysis, electro-osmosis B01D 61/42) [3]
- 47/08 . . . . subjected to a direct electric current [3]
- 47/10 . with moving ion-exchange material; with ion-exchange material in suspension or in fluidised-bed form [3]
- 47/12 . characterised by the use of ion-exchange material in the form of sheets, ribbons or filaments, e.g. membranes (electrodialysis, electro-osmosis B01D 61/42) [3]
- 47/14 . Controlling or regulating [3]

**49/00** *Regeneration or reactivation of ion-exchangers; Apparatus therefor (ion-exchange chromatography processes or apparatus B01D 15/08) [3,8]*

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

**B01L** **CHEMICAL OR PHYSICAL LABORATORY APPARATUS FOR GENERAL USE** (apparatus for medical or pharmaceutical purposes A61; apparatus for industrial purposes or laboratory apparatus whose construction and performance are comparable to that of similar industrial apparatus, see the relevant classes for industrial apparatus, particularly subclasses of B01 and C12; separating or distilling apparatus B01D; mixing or stirring devices B01F; atomisers B05B; sieves B07B; corks, bungs B65D; handling liquids in general B67; vacuum pumps F04; siphons F04F 10/00; taps, stop-cocks F16K; tubes, tube joints F16L; apparatus specially adapted for investigating or analysing materials G01, particularly G01N; electrical or optical apparatus, see the relevant classes in sections G and H)

### Note

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** (fume cupboards B08B; provided with manipulation devices, glove boxes B25J; cooling chambers F25D)

- 1/02 . Air-pressure chambers; Air-locks therefor
- 1/04 . Dust-free rooms or enclosures

**3/00** **Containers or dishes for laboratory use, e.g. laboratory glassware** (bottles B65D; apparatus for enzymology or microbiology C12M 1/00); **Droppers** (receptacles for volumetric purposes G01F)

- 3/02 . Burettes; Pipettes
- 3/04 . Crucibles
- 3/06 . Crystallising dishes
- 3/08 . Flasks (specially adapted for distillation B01D)
- 3/10 . Wash bottles
- 3/12 . Gas jars or cylinders
- 3/14 . Test tubes
- 3/16 . Retorts
- 3/18 . Spatulas

**5/00** **Gas handling apparatus** (gas jars or cylinders B01L 3/12; cold traps, cold baffles B01D 8/00; separation of gases or vapours B01D 53/00; gas generators B01J 7/00; steam traps F16T)

- 5/02 . Gas collection apparatus, e.g. by bubbling under water (for sampling G01N)
- 5/04 . Gas washing apparatus, e.g. by bubbling

**7/00** **Heating or cooling apparatus** (evaporators B01D 1/00; drying gases or vapours, e.g. desiccators, B01D 53/26; autoclaves B01J 3/04; burners F23D; refrigeration or cooling, in general F25; drying ovens F26B; furnaces, ovens F27) [3]

- 7/02 . Water baths; Sand baths; Air baths

**9/00** **Supporting devices; Holding devices** (tweezers, tongs B25B)

- 9/02 . Laboratory benches or tables; Fittings therefor
- 9/04 . Retort stands; Retort clamps
- 9/06 . Test-tube stands; Test-tube holders

**11/00** **Apparatus not provided for in the preceding groups** (chemical indicators in general G01N)

- 11/02 . Heat insulating devices, e.g. jackets for flasks