CPC  COOPERATIVE PATENT CLASSIFICATION

C  CHEMISTRY; METALLURGY
(NOTES omitted)

CHEMISTRY

C01  INORGANIC CHEMISTRY
(NOTES omitted)

C01B  NON-METALLIC ELEMENTS; COMPOUNDS THEREOF; {METALLOIDS OR COMPOUNDS THEREOF NOT COVERED BY SUBCLASS C01C}

NOTES
1. 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.
2. Attention is drawn to the definitions of groups of chemical elements following the title of section C.

WARNINGS
1. The following IPC groups are not in the CPC scheme. The subject matter for these IPC groups is classified in the following CPC groups:
   - C01B 35/16, C01B 35/18 covered by C01B 35/00
2. In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

Hydrogen: Hydrides: Water: Synthesis gas from hydrocarbons

3/00  Hydrogen; Gaseous mixtures containing hydrogen; Separation of hydrogen from mixtures containing it (separation of gases by physical means B01D); Purification of hydrogen (production of water gas or synthesis gas from solid carbonaceous material C10J; purifying or modifying the chemical compositions of combustible technical gases containing carbon monoxide C10K)

NOTES
1. In this group it is desirable to add the indexing codes of groups B01J 2208/00 and B01J 2219/00, for details relating to the reactors used in the generation of hydrogen or synthesis gas.
2. In groups C01B 3/12 - C01B 3/18 and in groups C01B 3/22 - C01B 3/86; it is desirable to add the indexing codes of group C01B 2203/00, for aspects relating to hydrogen or synthesis gas generation processes.

3/005  {Reversible uptake of hydrogen by an appropriate medium, i.e. based on physical or chemical sorption phenomena or on reversible chemical reactions, e.g. for hydrogen storage purposes (purification of hydrogen C01B 3/508); Reversible gettering of hydrogen; Reversible uptake of hydrogen by electrodes}

3/001  . . . {characterised by the uptaking medium; Treatment thereof}

3/0015 . . . {Organic compounds; Solutions thereof}

3/0021 . . . {Carbon, e.g. active carbon, carbon nanotubes, fullerenes; Treatment thereof}

3/0026 . . . {of one single metal or a rare earth metal; Treatment thereof}

NOTES
1. In all of the groups C01B 3/0026 - C01B 3/0084, the metallic storage materials may contain minor quantities of non-metals such as B, C, O, S, Se, Si; e.g. C01B 3/0036 "only containing iron and titanium" includes Fe-Ti compositions comprising non-metals.
2. In the groups C01B 3/0026 and C01B 3/0047 - C01B 3/0068 a “rare-earth metal” means one single metal or a combination of metals selected from the lanthanides, Sc or Y.

3/0031 . . . {Intermetallic compounds; Metal alloys; Treatment thereof}

3/0036 . . . {only containing iron and titanium; Treatment thereof}

3/0042 . . . {only containing magnesium and nickel; Treatment thereof}

3/0047 . . . {containing a rare earth metal; Treatment thereof}

3/0052 . . . . . {also containing titanium}

3/0057 . . . . . {also containing nickel}

3/0063 . . . . . {only containing a rare earth metal and only one other metal}

3/0068 . . . . . {the other metal being nickel}

3/0073 . . . . . {Slurries, Suspensions}
Hydrogen; Hydrides; Water; Synthesis gas from hydrocarbons

3/0078 . . . . [Composite solid storage mediums, i.e. coherent or loose mixtures of different solid constituents, chemically or structurally heterogeneous solid masses, coated solids or solids having a chemically modified surface region]

3/0084 . . . . [Solid storage mediums characterised by their shape, e.g. pellets, sintered shaped bodies, sheets, porous compacts, spongy metals, hollow particles, solids with cavities, layered solids]

3/0089 . . . . [Ortho-para conversion]

3/0094 . . . . [Atomic hydrogen]

3/02 . . . . Production of hydrogen or of gaseous mixtures containing [a substantial proportion of] hydrogen

3/025 . . . . [Preparation or purification of gas mixtures for ammonia synthesis]

3/04 . . . . by decomposition of inorganic compounds, e.g. ammonia [(C01B 3/0005 takes precedence)]

3/042 . . . . [ Decomposition of water]

3/045 . . . . [in gaseous phase]

3/047 . . . . [ Decomposition of ammonia]

3/06 . . . . by reaction of inorganic compounds containing electro-positively bound hydrogen, e.g. water, acids, bases, ammonia, with inorganic reducing agents (by electrolysis of water C25B 1/04)

3/061 . . . . [ by reaction of metal oxides with water]

3/063 . . . . [ Cyclic methods]

3/065 . . . . [from a hydride]

3/066 . . . . [by reaction of water with phosphorus]

3/068 . . . . [the hydrogen being generated from the water as a result of a cycle of reactions, not covered by groups C01B 3/063 or C01B 3/105]

3/08 . . . . with metals

3/10 . . . . by reaction of water vapour with metals

3/105 . . . . [ Cyclic methods]

3/12 . . . . by reaction of water vapour with carbon monoxide

3/14 . . . . Handling of heat and steam

3/16 . . . . using catalysts

3/18 . . . . using moving solid particles

3/20 . . . . by reaction of metal hydroxides with carbon monoxide

3/22 . . . . by decomposition of gaseous or liquid organic compounds ([(C01B 3/0005 takes precedence)]: coking liquid carbonaceous materials C10B 55/00)

3/24 . . . . of hydrocarbons

3/26 . . . . using catalysts

3/28 . . . . using moving solid particles

3/30 . . . . . . . . . . . . using the fluidised bed technique

3/32 . . . . by reaction of gaseous or liquid organic compounds with gasifying agents, e.g. water, carbon dioxide, air

3/323 . . . . [ Catalytic reaction of gaseous or liquid organic compounds other than hydrocarbons with gasifying agents]

3/326 . . . . [characterised by the catalyst]

3/34 . . . . by reaction of hydrocarbons with gasifying agents

3/342 . . . . [with the aid of electrical means, electromagnetic or mechanical vibrations, or particle radiations]

3/344 . . . . [using non-catalytic solid particles]

3/346 . . . . [using heat generated by superheated steam]

3/348 . . . . [by direct contact with heat accumulating liquids, e.g. molten metals, molten salts]

3/36 . . . . using oxygen or mixtures containing oxygen as gasifying agents

3/363 . . . . [characterised by the burner used]

3/366 . . . . [Partial combustion in internal-combustion engines]

3/38 . . . . using catalysts

3/382 . . . . [Multi-step processes]

3/384 . . . . [the catalyst being continuously externally heated]

3/386 . . . . [Catalytic partial combustion]

3/388 . . . . [the heat being generated by superheated steam]

3/40 . . . . characterised by the catalyst

3/42 . . . . using moving solid particles

3/44 . . . . using the fluidised bed technique

3/46 . . . . using discontinuously preheated non-moving solid materials, e.g. blast and run

3/48 . . . . followed by reaction of water vapour with carbon monoxide

3/50 . . . . Separation of hydrogen or hydrogen containing gases from gaseous mixtures, e.g. purification (C01B 3/14 takes precedence)

3/501 . . . . [by diffusion]

3/503 . . . . [characterised by the membrane]

3/505 . . . . [Membranes containing palladium]

3/506 . . . . [at low temperatures]

3/508 . . . . [by selective and reversible uptake by an appropriate medium, i.e. the uptake being based on physical or chemical sorption phenomena or on reversible chemical reactions (the appropriate mediums per se C01B 3/0005)]

3/52 . . . . by contacting with liquids; Regeneration of used liquids [(C01B 3/508 takes precedence)]

3/54 . . . . including a catalytic reaction

3/56 . . . . by contacting with solids; Regeneration of used solids [(C01B 3/508 takes precedence)]

3/58 . . . . including a catalytic reaction

3/583 . . . . [the reaction being the selective oxidation of carbon monoxide]

3/586 . . . . [the reaction being a methanation reaction]

4/00 Hydrogen isotopes; Inorganic compounds thereof prepared by isotope exchange, e.g. NH₃ + D₂ --- > NH₃D + HD (separation of isotopes B01D 59/00; other chemical reactions to form compounds of hydrogen isotopes, see the relevant groups for hydrogen compounds in class C01)

5/00 Water

5/02 Heavy water; Preparation by chemical reaction of hydrogen isotopes or their compounds, e.g. 4ND₃ + 7O₂ --- > 4NO₂ + 6D₂O, 2D₂ + O₂ --- > 2D₂O

6/00 Hydrides of metals [including fully or partially hydrided metals, alloys or intermetallic compounds (use of some thereof for reversible sorption of hydrogen C01B 3/0005, C01B 3/508); Compounds containing at least one metal-hydrogen bond, e.g. (GeH₃)₂S, SiH₃GeH]; Monoborane or diborane; Addition complexes thereof (higher hydrides of boron, substituted hydrides of boron C01B 35/00)
Hydrogen; Hydrides; Water; Synthesis gas from hydrocarbons

6/003 . . . [Hydrides containing only one metal and one or several non-metals]
6/006 . . . [only one metal and one or several halogens]
6/02 . . . Hydrides of transition elements; Addition complexes thereof
6/04 . . . Hydrides of alkali metals, alkaline earth metals, beryllium or magnesium; Addition complexes thereof
6/06 . . . Hydrides of aluminium, gallium, indium, thallium, germanium, tin, lead, arsenic, antimony, bismuth or polonium; Monoborane; Diborane; Addition complexes thereof
6/065 . . . [Hydrides of arsenic or antimony]
6/10 . . . Monoborane; Diborane; Addition complexes thereof
6/11 . . . Preparation from boron or inorganic compounds containing boron and oxygen
6/13 . . . Addition complexes of monoborane or diborane, e.g. with phosphine, arsine or hydrazine
6/15 . . . . Metal borohydrides; Addition complexes thereof
6/17 . . . . . Preparation from boron or inorganic compounds containing boron and oxygen
6/19 . . . . . Preparation from other compounds of boron
6/21 . . . . . Preparation of borohydrides of alkali metals, alkaline earth metals, magnesium or beryllium; Addition complexes thereof, e.g. LiBH₄, NaBH₄, NaBH₃
6/23 . . . . . Preparation of borohydrides of other metals, e.g. aluminium borohydride; Addition complexes thereof, e.g. Li[Al(BH₄)₃]H
6/24 . . . . . Hydrides containing at least two metals; Addition complexes thereof (C01B 6/13 - C01B 6/23 take precedence)
6/243 . . . [containing only hydrogen, aluminium and alkali metals, e.g. Li(AlH₃)]
6/246 . . . [also containing non-metals other than hydrogen]
6/26 . . . Preparation from the metal with the highest valency or from its oxides or salts of its oxyacids
6/34 . . . Purification; Stabilisation

Halogens, compounds thereof

7/00 Halogens; Halogen acids (oxyacids C01B 11/00)
7/01 . . . Chlorine; Hydrogen chloride
7/012 . . . [Preparation of hydrogen chloride from the elements]
7/015 . . . [Chlorine hydrates; Obtaining chlorine therefrom]
7/017 . . . [Preparation of hydrogen chloride by reacting together chlorine, water and carbon or carbon monoxide (the carbon not acting only as catalyst)]
7/03 . . . Preparation from chlorides
7/035 . . . [Preparation of hydrogen chloride from chlorides]
7/04 . . . Preparation of chlorine from hydrogen chloride
7/05 . . . Preparation from ammonium chloride
7/055 . . . [Preparation of hydrogen chloride from ammonium chloride]
7/07 . . . Purification {; Separation (C01B 7/015 takes precedence)}
7/0706 . . . {of hydrogen chloride}
7/0712 . . . {by distillation}
7/0718 . . . {by adsorption}
7/0725 . . . {by active carbon}
7/0731 . . . {by extraction}
7/0737 . . . {hydrogen chloride being extracted}
7/0743 . . . {of gaseous or dissolved chlorine}
7/075 . . . . of liquid chlorine
7/09 . . . Bromine; Hydrogen bromide
7/093 . . . {Hydrogen bromide}
7/096 . . . {Bromine}
7/13 . . . Iodine; Hydrogen iodide
7/135 . . . {Hydrogen iodide}
7/14 . . . . Iodine
7/16 . . . . Preparation from seaweed
7/19 . . . Fluorine; Hydrogen fluoride
7/191 . . . {Hydrogen fluoride}
7/192 . . . {Preparation from fluorspar}
7/193 . . . {Preparation from silicon tetrafluoride, fluorsilicic acid or fluosilicates}
7/194 . . . {Preparation from ammonium fluoride}
7/195 . . . {Separation; Purification}
7/196 . . . . {by distillation}
7/197 . . . . {by adsorption}
7/198 . . . . {by solid ion-exchangers}
7/20 . . . . Fluorine
7/24 . . . . Inter-halogen compounds

9/00 General methods of preparing halides (particular individual halides, see the relevant groups in C01B; C01G according to the element combined with the halogen; electrolytic production of inorganic compounds C25B)
9/02 . . . Chlorides
9/04 . . . Bromides
9/06 . . . Iodides
9/08 . . . Fluorides

11/00 Oxides or oxyacids of halogens; Salts thereof
11/02 . . . Oxides of chlorine
11/021 . . . {Chlorine hemioxide (Cl₂O)}
11/022 . . . {Chlorine dioxide (ClO₂)}
11/023 . . . {Preparation from chlorites or chlorates}
11/024 . . . . {from chlorites}
11/025 . . . . {from chlorates without any other reaction reducing agent than chloride ions}
11/026 . . . {from chlorate ions in the presence of a peroxidic compound, e.g. hydrogen peroxide, ozone, peroxysulfates}
11/027 . . . {from chlorate ions in the presence of a nitrogen compound selected from nitrogen dioxide, nitrate or nitrite ions, nitrosylchloride, hydrazine or hydrazine compounds}
11/028 . . . {Separation; Purification}
11/029 . . . {Chlorine trioxide (ClO₃); Chlorine hexoxide (Cl₃O₆); Chlorine heptoxide (Cl₃O₇)}
11/04 . . . Hypochlorous acid
11/06 . . . Hypochlorites
11/062 . . . {Hypochlorites of alkali metals}
11/064 . . . {Hypochlorites of alkaline-earth metals}
### Oxygen: Oxides or hydroxides in general: Per-compounds

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>13/00</td>
<td>Oxygen; Ozone; Oxides or hydroxides in general</td>
</tr>
<tr>
<td>13/02</td>
<td>Preparation of oxygen (by liquefying F25)</td>
</tr>
<tr>
<td>13/0203</td>
<td>(from inorganic compounds)</td>
</tr>
<tr>
<td>13/0207</td>
<td>[Water]</td>
</tr>
<tr>
<td>13/0211</td>
<td>[Peroxy compounds]</td>
</tr>
<tr>
<td>13/0214</td>
<td>(Hydrogen peroxide)</td>
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<tr>
<td>13/0218</td>
<td>[Chlorate]</td>
</tr>
<tr>
<td>13/0222</td>
<td>(from organic compounds)</td>
</tr>
<tr>
<td>13/0225</td>
<td>[Peroxy compounds]</td>
</tr>
<tr>
<td>13/0229</td>
<td>[Purification or separation processes]</td>
</tr>
</tbody>
</table>

#### NOTE

In groups C01B 13/0229 - C01B 13/0288, additional features relating to the preparation or separation processes are indexed with codes chosen from C01B 2210/0025 - C01B 2210/0098.

13/0233 | [Chemical processing only] |
13/0237 | (by oxidation) |
13/024 | (by reduction) |
13/0244 | (by complexation) |
13/0248 | [Physical processing only] |
13/0251 | (by making use of membranes) |
13/0255 | [characterised by the type of membrane] |
13/0259 | (by adsorption on solids) |
13/0262 | [characterised by the adsorbent] |
13/0266 | [Carbon based materials] |
13/027 | [Zeolites] |
13/0274 | [Other molecular sieve materials] |
13/0277 | [Temperature swing adsorption] |
13/0281 | (in getters) |
13/0285 | (by absorption in liquids) |
13/0288 | [Combined chemical and physical processing] |

#### NOTE

In this group, processing steps are indexed with codes chosen from C01B 2210/0001 - C01B 2210/0025.

13/0292 | (Preparation from air using a molten phase containing alkali metal nitrite, optionally together with other oxygen acceptors)
Oxygen; Oxides or hydroxides in general; Per-compounds

15/0135 . . . [Purification by solid ion-exchangers or solid chelating agents]
15/017 . . . Anhydrous hydrogen peroxide; Anhydrous solutions or gaseous mixtures containing hydrogen peroxide
15/022 . . . Preparation from organic compounds
15/023 . . . by the alkyl-anthraquinone process
15/024 . . . from hydrocarbons
15/026 . . . from alcohols
15/027 . . . Preparation from water
15/0275 . . . [Preparation by reaction of water, carbon monoxide and oxygen]
15/029 . . . Preparation from hydrogen and oxygen
15/0295 . . . [by electrical discharge]
15/03 . . . Preparation from inorganic peroxo compounds, e.g. from peroxy sulfates
15/032 . . . from metal peroxides
15/037 . . . Stabilisation by additives
15/04 . . . Metal peroxides or peroxyhydrates thereof; [Metal] superoxides; [Metal] ozonides; [Peroxyhydrates thereof]
15/043 . . . of alkali metals, alkaline earth metals or magnesium {or beryllium or aluminium}
15/0435 . . . [of alkali metals]
15/047 . . . of heavy metals
15/0475 . . . [of actinides]
15/055 . . . Peroxy hydrates (C01B 15/04 takes precedence); Peroxycacids or salts thereof
15/06 . . . containing sulfur
15/08 . . . Peroxy sulfates
15/085 . . . [Stabilisation of the solid compounds, subsequent to the preparation or to the crystallisation, by additives or by coating]
15/10 . . . containing carbon
15/103 . . . [containing only alkali metals as metals]
15/106 . . . [Stabilisation of the solid compounds, subsequent to the preparation or to the crystallisation, by additives or by coating]
15/12 . . . containing boron
15/123 . . . [Stabilisation of the solid compounds, subsequent to the preparation or to the crystallisation, by additives or by coating]
15/126 . . . [Dehydration of solid hydrated peroxyborates to less hydrated or anhydrous products]
15/14 . . . containing silicon
15/16 . . . containing phosphorus

17/00 Sulfur; Compounds thereof
17/02 . . . Preparation of sulfur; Purification
17/0205 . . . [Separation of sulfur from liquids, e.g. by coalescence]
17/021 . . . [Separation of sulfur from gases]
17/0216 . . . [Solidification or cooling of liquid sulfur]
17/0221 . . . [Melting]
17/0226 . . . [Vaporising or superheating]
17/0232 . . . [Purification, e.g. degassing]
17/0237 . . . [Converting into particles, e.g. by granulation, milling]
17/0243 . . . [Other after-treatment of sulfur]
17/0248 . . . [of particulate sulfur]
17/0253 . . . [from non-gaseous sulfur compounds other than sulfides or materials containing such sulfides]
17/0259 . . . [by reduction of sulfates]
17/0264 . . . [of calcium sulfates]
17/027 . . . Recovery of sulfur from material containing elemental sulfur, e.g. luxmasses {or sulfur containing ores}; Purification {of the recovered sulfur}
17/033 . . . using a liquid extractant
17/04 . . . from gaseous sulfur compounds including gaseous sulfides
17/0404 . . . [by processes comprising a dry catalytic conversion of hydrogen sulfide-containing gases, e.g. the Claus process]
17/0408 . . . [Pretreatment of the hydrogen sulfide containing gases]
17/0413 . . . [characterised by the combustion step]
17/0417 . . . [Combustion reactors]
17/0421 . . . [Multistage combustion]
17/0426 . . . [characterised by the catalytic conversion]
17/043 . . . [Catalytic converters]
17/0434 . . . [Catalyst compositions]
17/0439 . . . [at least one catalyst bed operating below the dew-point of sulfur]
17/0443 . . . [in a moving bed]
17/0447 . . . [Separation of the obtained sulfur]
17/0452 . . . [Process control; Start-up or cooling-down procedures of the Claus process]
17/0456 . . . [the hydrogen sulfide-containing gas being a Claus process tail gas]
17/046 . . . [without intermediate formation of sulfur dioxide]
17/0465 . . . [Catalyst compositions]
17/0469 . . . [at least one catalyst bed operating below the dew-point of sulfur]
17/0473 . . . [by reaction of sulfur dioxide or sulfur trioxide containing gases with reducing agents other than hydrogen sulfide]
17/0478 . . . [with hydrocarbons or mixtures containing them]
17/0482 . . . [with carbon or solid carbonaceous materials]
17/0486 . . . [with carbon monoxide or carbon monoxide containing mixtures]
17/0491 . . . [with hydrogen or hydrogen-containing mixtures, e.g. synthesis gas]
17/0495 . . . [by dissociation of hydrogen sulfide into the elements]
17/05 . . . by wet processes
17/06 . . . from non-gaseous sulfides or materials containing such sulfides, e.g. ores
17/10 . . . Finely divided sulfur, e.g. sublimed sulfur, flowers of sulfur
17/12 . . . Insoluble sulfur (mu-sulfur)
17/125 . . . [Sulfur isotopes other than 32S]
17/16 . . . Hydrogen sulfides
17/161 . . . [Preparation from elemental sulfur]
17/162 . . . [from elemental sulfur and hydrogen]
17/164 . . . [Preparation by reduction of oxidic sulfur compounds]
17/165 . . . [Preparation from sulfides, oxysulfides or polysulfides]
17/167 . . . [Separation]
17/168 . . . [Purification]
17/18 . . . Hydrogen polysulfides
Oxygen; Oxides or hydroxides in general; Per-compounds

17/20 . Methods for preparing sulfides or polysulfides, in general (ammonium sulfides or polysulfides C01C; sulfides or polysulfides of metals, other than alkali metals, magnesium, calcium, strontium and barium, see the relevant groups of subclasses C01F or C01G, according to the metal)

17/22 . Alkali metal sulfides or polysulfides

17/24 . Preparation by reduction

17/26 . . . with carbon

17/28 . . . with reducing gases

17/30 . . . Preparation from sodium or potassium amalgam with sulfur or sulfides

17/32 . . . Hydrosulfides of sodium or potassium

17/34 . . . Polysulfides of sodium or potassium

17/36 . . . Purification

17/38 . . . Dehydration

17/40 . . . Making shaped products, e.g. granules

17/42 . . . Sulfides or polysulfides of magnesium, calcium, strontium, or barium

17/43 . . . from oxides or hydroxides with sulfur or hydrogen sulfide

17/44 . . . by reduction of sulfates

17/45 . . . Compounds containing sulfur and halogen, with or without oxygen

17/4507 . . . [containing sulfur and halogen only]

17/4515 . . . [containing sulfur and fluorine only]

17/4523 . . . [Sulfur tetrafluoride]

17/453 . . . [Sulfur hexafluoride]

17/4538 . . . [containing sulfur and chlorine only]

17/4546 . . . [Sulfur dichloride]

17/4553 . . . [Sulfur hexachloride]

17/4561 . . . [Compounds containing sulfur, halogen and oxygen only]

17/4569 . . . [Thionyl fluoride (SOF₂)]

17/4576 . . . [Sulfuryl fluoride (SO₂F₂)]

17/4584 . . . [Thionyl chloride (SOCl₂)]

17/4592 . . . [Sulfuryl chloride (SO₂Cl₂)]

17/46 . . . Compounds containing sulfur, halogen, hydrogen, and oxygen

17/463 . . . [Fluorosulfonic acid (FSO₃H)]

17/466 . . . [Chlorosulfonic acid (ClSO₃H)]

17/48 . . . Sulfur dioxide; Sulfurous acid

17/50 . . . Preparation of sulfur dioxide

17/501 . . . [by reduction of sulfur compounds]

17/502 . . . [of sulfur trioxide]

17/503 . . . [of sulfuric acid]

17/504 . . . [of ammonium sulfates (of ammonium sulfates containing sulfuric acid solutions C01B 17/585)]

17/505 . . . [of alkali metal sulfates]

17/506 . . . [of calcium sulfates]

17/507 . . . [of iron sulfates]

17/508 . . . [by oxidation of sulfur compounds]

17/52 . . . by roasting sulfides (preliminary treatment of ores or scrap C22B 1/00)

17/54 . . . by burning elemental sulfur

17/56 . . . Separation; Purification

17/58 . . . Recovery of sulfur dioxide from acid tar or the like [or from any waste sulfuric acid]

17/585 . . . [from ammonium sulfate containing sulfuric acid solutions]

17/60 . . . Isolation of sulfur dioxide from gases

17/62 . . . Methods of preparing sulfites in general (particular individual sulfites, see the relevant groups of subclasses C01B - C01G, according to the cation)

17/625 . . . [metabisulfites or pyrosulfites]

17/64 . . . Thiosulfates; Dithionites; Polythionates

17/66 . . . Dithionites [or hydrosulfites (S₂O₃²⁻)]

17/665 . . . [Stabilisation by additives subsequent to preparation; Dust prevention by additives]

17/69 . . . Sulfur trioxide; Sulfuric acid

17/70 . . . Stabilisation of gamma-form sulfur trioxide

17/74 . . . Preparation

17/745 . . . [from sulfates]

17/76 . . . by contact processes

17/762 . . . [High pressure processes]

17/765 . . . Multi-stage SO₂-conversion

17/7655 . . . [with intermediate absorption]

17/77 . . . Fluidised-bed processes

17/775 . . . Liquid phase contacting processes or wet catalysis processes

17/78 . . . characterised by the catalyst used

17/79 . . . containing vanadium

17/80 . . . Apparatus

17/803 . . . [Converters]

17/806 . . . [Absorbers; Heat exchangers]

17/82 . . . of sulfuric acid using a nitrogen oxide process

17/84 . . . Chamber process

17/86 . . . Tower process

17/88 . . . Concentration of sulfuric acid

17/90 . . . Separation; Purification

17/901 . . . [Recovery from spent acids containing metallic ions, e.g. hydrolysis acids, pickling acids (obtaining sulfur dioxide as an intermediate in sulfur trioxide recovery from sulfates, e.g. iron sulfates C01B 17/501, from spent acids C01B 17/58)]

17/902 . . . [by dialysis]

17/903 . . . [by liquid-liquid extraction]

17/904 . . . [by ion-exchange]

17/905 . . . [Removal of organic impurities]

17/906 . . . [Removal of mercury]

17/907 . . . [Removal of arsenic]

17/908 . . . [Removal of antimony or bismuth]

17/92 . . . Recovery from acid tar or the like, e.g. alkylation acids (obtaining sulfur dioxide as an intermediate in sulfur trioxide recovery therefrom C01B 17/58)

17/925 . . . [by processes involving a liquid-liquid extraction]

17/94 . . . Recovery from nitration acids

17/96 . . . Methods for the preparation of sulfates in general (particular individual sulfates, see the relevant groups of subclasses C01B - C01G, according to the cation)

17/965 . . . [Pyrosulfates]

17/98 . . . Other compounds containing sulfur and oxygen (sulfuric acids C01B 15/06; persulfates C01B 15/08)

19/00 . . . Selenium; Tellurium; Compounds thereof (phosphorus compounds C01B 25/14)

19/001 . . . [Preparation involving a liquid-liquid extraction, an adsorption or an ion-exchange]
Oxygen; Oxides or hydroxides in general; Per-compounds

21/06  .  [Oxides; Hydroxides]
21/05  .  [Halides]
21/08  .  (Tellurides or selenides of metals (C01B 19/002 takes precedence))
21/05  .  [Salts of oxyacids of selenium or tellurium]
21/06  .  [Elemental selenium or tellurium]

21/04  .  Binary compounds [including binary selenium-tellurium compounds (C01B 19/004, C01B 19/005, C01B 19/007 take precedence)]

21/00  Nitrogen; Compounds thereof

21/02  .  Preparation of nitrogen (by decomposition of ammonia (C01B 3/047))
21/04  .  Purification or separation of nitrogen (by liquefying F25J)
21/0405  .  [Purification or separation processes]

NOTE
In this group, additional features relating to the purification or separation processes are indexed with codes chosen from C01B 2210/0026 - C01B 2210/0098

21/0411  .  .  .  [Chemical processing only]
21/0416  .  .  .  .  [by oxidation]
21/0422  .  .  .  [by reduction]
21/0427  .  .  .  [by complexation]
21/0433  .  .  .  [Physical processing only]
21/0438  .  .  .  [by making use of membranes]
21/0444  .  .  .  [characterised by the membrane]
21/0445  .  .  .  [by adsorption in solids]
21/0455  .  .  .  [characterised by the adsorbent]
21/0461  .  .  .  .  [Carbon based materials]
21/0466  .  .  .  [Zeolites]
21/0472  .  .  .  .  [Other molecular sieve materials]
21/0477  .  .  .  [Temperature swing adsorption]
21/0483  .  .  .  .  [in getters]
21/0488  .  .  .  [by absorption in liquids]
21/0494  .  .  [Combined chemical and physical processing]

NOTE
In this group, processing steps are indexed with codes chosen from C01B 2210/0001 - C01B 2210/0025

21/06  .  Binary compounds of nitrogen with metals, with silicon, or with boron, or with carbon, i.e. nitrides; Compounds of nitrogen with more than one metal, silicon or boron](azides C01B 21/00)

NOTES
1. Binary compounds, i.e. compounds of nitrogen with only one other element chosen from metals, silicon, boron or carbon, are classified in groups C01B 21/06 or C01B 21/0605 - C01B 21/076. Compounds of nitrogen with more than one element chosen from metals, silicon or boron are classified in C01B 21/0602
2. Documents relating to several specific binary compounds are classified in C01B 21/06 only and receive the indexing codes chosen from C01B 21/0602 - C01B 21/076 to identify the specific compounds

21/0602  .  .  .  [with two or more other elements chosen from metals, silicon or boron]
21/0605  .  .  [Binary compounds of nitrogen with carbon]
21/0607  .  .  [with alkali metals]
21/061  .  .  .  [with lithium]
21/0612  .  .  [with alkaline-earth metals, beryllium or magnesium]
21/0615  .  .  .  [with transition metals other than titanium, zirconium or hafnium]
21/0617  .  .  .  [with vanadium, niobium or tantalum]
21/062  .  .  [with chromium, molybdenum or tungsten]
21/0622  .  .  .  [with iron, cobalt or nickel]
21/0625  .  .  [with copper]
21/0627  .  .  .  [with one or more rare earth metals]
21/063  .  .  .  [with one or more actinides, e.g. UN, PuN]
21/0632  .  .  [with gallium, indium or thallium]
21/0635  .  .  [with germanium, tin or lead]
21/0637  .  .  [with metals not specified in groups C01B 21/0607 - C01B 21/0635, other than aluminium, titanium, zirconium or hafnium]
21/0638  .  .  .  [with boron]
21/0641  .  .  [Preparation by direct nitridation of elemental boron]
21/0643  .  .  [Preparation from boron halides]
21/0645  .  .  [Preparation by carboreductive nitridation]
21/0646  .  .  [Preparation by pyrolysis of boron and nitrogen containing compounds]
21/0648  .  .  [After-treatment, e.g. grinding, purification (transformation of hexagonal into cubic or wurztitic boron nitride C04B 35/5831)]
21/068  .  .  [with silicon]
21/0682  .  .  [Preparation by direct nitridation of silicon]
21/0685  .  .  [Preparation by carboreductive nitridation]
21/0687  .  .  [After-treatment, e.g. grinding, purification]
21/072  .  .  [with aluminium]
21/0722  .  .  [Preparation by direct nitridation of aluminium]
21/0724  .  .  [using a plasma]
21/0726  .  .  [Preparation by carboreductive nitridation]
21/0728  .  .  [After-treatment, e.g. grinding, purification]
21/076  .  .  [with titanium or zirconium (or hafnium)]
21/0761  .  .  [Preparation by direct nitridation of titanium, zirconium or hafnium]
21/0763  .  .  [Preparation from titanium, zirconium or hafnium halides]
21/0765  .  [Preparation by carboreductive nitridation]
21/0766  .  [Preparation by pyrolysis of nitrogen containing titanium, zirconium or hafnium compounds]
21/0768  .  [After-treatment, e.g. grinding, purification]
21/08  .  [Hydrazoic acid; Azides; Halogen azides]
21/082  .  [Compounds containing nitrogen and non-metals (and optionally metals) (C01B 21/06, C01B 21/08 take precedence)]
21/0821  .  .  [Oxynitrides of metals, boron or silicon]
21/0823  .  [Silicon oxynitrides]
21/0825  .  [Aluminium oxynitrides]
21/0826  .  [Silicon aluminium oxynitrides, i.e. sialons]
21/0828  .  [Carbonitrides or oxycarbonitrides of metals, boron or silicon]
<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>21/083</td>
<td>. . containing one or more halogen atoms</td>
</tr>
<tr>
<td>21/082</td>
<td>. . [Binary compounds of nitrogen with halogens]</td>
</tr>
<tr>
<td>21/0835</td>
<td>. . [Nitrogen trifluoride]</td>
</tr>
<tr>
<td>21/0837</td>
<td>. . [Purification]</td>
</tr>
<tr>
<td>21/084</td>
<td>. . containing also one or more oxygen atoms, e.g. nitrosoyl halides</td>
</tr>
<tr>
<td>21/0842</td>
<td>. . [Halides of nitrogen oxides]</td>
</tr>
<tr>
<td>21/0844</td>
<td>. . [Nitrosyl fluoride]</td>
</tr>
<tr>
<td>21/0846</td>
<td>. . [Nitrosyl chloride]</td>
</tr>
<tr>
<td>21/0848</td>
<td>. . [Nitrosyl perchlorate]</td>
</tr>
<tr>
<td>21/086</td>
<td>. . containing one or more sulfur atoms</td>
</tr>
<tr>
<td>21/0865</td>
<td>. . [Binary compounds of nitrogen with sulfur]</td>
</tr>
<tr>
<td>21/087</td>
<td>. . containing one or more hydrogen atoms</td>
</tr>
<tr>
<td>21/088</td>
<td>. . containing also one or more halogen atoms</td>
</tr>
<tr>
<td>21/09</td>
<td>. . Halogeno-amines, e.g. chloramine</td>
</tr>
<tr>
<td>21/091</td>
<td>. . . . . . [Chloramine, i.e. NH₂Cl or dichloramine, i.e. NHCl₂]</td>
</tr>
<tr>
<td>21/092</td>
<td>. . containing also one or more metal atoms</td>
</tr>
<tr>
<td>21/0923</td>
<td>. . . . . . [Metal imides or amides (silicon imides or amides C01B 21/087)]</td>
</tr>
<tr>
<td>21/0926</td>
<td>. . . . . . [of alkali metals]</td>
</tr>
<tr>
<td>21/093</td>
<td>. . containing also one or more sulfur atoms</td>
</tr>
<tr>
<td>21/0935</td>
<td>. . . . . . [imidodisulfonic acid; Nitritoltrisulfonic acid; Salts thereof]</td>
</tr>
<tr>
<td>21/094</td>
<td>. . . . . . Nitrosyl containing acids</td>
</tr>
<tr>
<td>21/096</td>
<td>. . . . . . Amidosulfonic acid; Salts thereof</td>
</tr>
<tr>
<td>21/097</td>
<td>. . . . . . containing phosphorus atoms</td>
</tr>
<tr>
<td>21/0975</td>
<td>. . . . . . containing also one or more sulfur atoms</td>
</tr>
<tr>
<td>21/098</td>
<td>. . . . . . Phosphonitrilic dihalides; Polymers thereof</td>
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<tr>
<td>21/0983</td>
<td>. . . . . . [Phosphonitrilic difluorides; Polymers thereof]</td>
</tr>
<tr>
<td>21/0986</td>
<td>. . . . . . [Phosphonitrilic dichlorides; Polymers thereof]</td>
</tr>
<tr>
<td>21/12</td>
<td>. . Carboxylic acid or thiocarboxylic acid; Salts thereof</td>
</tr>
<tr>
<td>21/125</td>
<td>. . [Metal carboxylics]</td>
</tr>
<tr>
<td>21/14</td>
<td>. . Hydroxylamine; Salts thereof</td>
</tr>
<tr>
<td>21/1409</td>
<td>. . [Preparation]</td>
</tr>
<tr>
<td>21/1418</td>
<td>. . . . . . [by catalytic reduction of nitrogen oxides or nitrates with hydrogen]</td>
</tr>
<tr>
<td>21/1427</td>
<td>. . . . . . [by reduction of nitrogen oxides or nitrates with bisulfite or sulfur dioxide, e.g. by the Raschig process]</td>
</tr>
<tr>
<td>21/1436</td>
<td>. . . . . . [by reaction in the gas phase, e.g. of nitrogen, hydrogen and oxygen]</td>
</tr>
<tr>
<td>21/1445</td>
<td>. . . . . . [of hydroxylamine from its salts]</td>
</tr>
<tr>
<td>21/1454</td>
<td>. . . . . . [of hydroxylamine salts by processes not covered by one or more of groups C01B 21/1418 - C01B 21/1445, e.g. by conversion of one salt into another]</td>
</tr>
<tr>
<td>21/1463</td>
<td>. . . . . . [Concentration]</td>
</tr>
<tr>
<td>21/1472</td>
<td>. . . . . . [Separation]</td>
</tr>
<tr>
<td>21/1481</td>
<td>. . . . . . [Purification]</td>
</tr>
<tr>
<td>21/149</td>
<td>. . . . . . [Stabilisation]</td>
</tr>
<tr>
<td>21/16</td>
<td>. . . . . . Hydrazine; Salts thereof</td>
</tr>
<tr>
<td>21/20</td>
<td>. . Nitrogen oxides; Oxycarboxylic acids of nitrogen; Salts thereof</td>
</tr>
<tr>
<td>21/203</td>
<td>. . [Preparation of nitrogen oxides using a plasma or an electric discharge]</td>
</tr>
<tr>
<td>21/206</td>
<td>. . . . . . [Nitric anhydride (N₂O₅)] (C01B 21/203 takes precedence)</td>
</tr>
<tr>
<td>21/22</td>
<td>. . Nitrous oxide (N₂O) (C01B 21/203 takes precedence)</td>
</tr>
<tr>
<td>21/24</td>
<td>. . . . . . Nitric oxide (NO) (C01B 21/203 takes precedence)</td>
</tr>
<tr>
<td>21/26</td>
<td>. . . . . . Preparation by catalytic [or non-catalytic] oxidation of ammonia</td>
</tr>
<tr>
<td>21/262</td>
<td>. . . . . . [obtaining nitrogen dioxide or tetroxide]</td>
</tr>
<tr>
<td>21/265</td>
<td>. . . . . . [characterised by the catalyst]</td>
</tr>
<tr>
<td>21/267</td>
<td>. . . . . . [Means for preventing deterioration or loss of catalyst or for recovering lost catalyst]</td>
</tr>
<tr>
<td>21/28</td>
<td>. . . . . . Apparatus</td>
</tr>
<tr>
<td>21/30</td>
<td>. . . . . . Preparation by oxidation of nitrogen</td>
</tr>
<tr>
<td>21/32</td>
<td>. . . . . . Apparatus</td>
</tr>
<tr>
<td>21/34</td>
<td>. . . . . . Nitrogen trioxide (N₂O₃) (C01B 21/203 takes precedence)</td>
</tr>
<tr>
<td>21/36</td>
<td>. . . . . . Nitrogen dioxide (NO₂, N₂O₄) (C01B 21/203, C01B 21/26, C01B 21/30 take precedence)</td>
</tr>
<tr>
<td>21/38</td>
<td>. . . . . . Nitric acid</td>
</tr>
<tr>
<td>21/40</td>
<td>. . . . . . Preparation by absorption of oxides of nitrogen</td>
</tr>
<tr>
<td>21/42</td>
<td>. . . . . . Preparation from nitrates</td>
</tr>
<tr>
<td>21/44</td>
<td>. . . . . . Concentration (C01B 21/40 takes precedence)</td>
</tr>
<tr>
<td>21/46</td>
<td>. . . . . . Purification; Separation (C01B 21/40 takes precedence)</td>
</tr>
<tr>
<td>21/48</td>
<td>. . Methods for the preparation of nitrates in general (particular individual nitrates, see the relevant groups of subclasses C01B - C01G, according to the cation)</td>
</tr>
<tr>
<td>21/50</td>
<td>. . Nitrous acid; Salts thereof</td>
</tr>
<tr>
<td>23/00</td>
<td>Noble gases; Compounds thereof (liquefying F25J 3/028)</td>
</tr>
<tr>
<td>23/0005</td>
<td>. . [Compounds of noble gases]</td>
</tr>
<tr>
<td>23/001</td>
<td>. . [Purification or separation processes of noble gases]</td>
</tr>
<tr>
<td>23/0015</td>
<td>. . . . . . [Chemical processing only]</td>
</tr>
<tr>
<td>23/0021</td>
<td>. . . . . . . [by oxidation]</td>
</tr>
<tr>
<td>23/0026</td>
<td>. . . . . . . [by reduction]</td>
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<tr>
<td>23/0031</td>
<td>. . . . . . . [by complexation]</td>
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<tr>
<td>23/0036</td>
<td>. . . . . . . [Physical processing only]</td>
</tr>
<tr>
<td>23/0042</td>
<td>. . . . . . . . . . . . [by making use of membranes]</td>
</tr>
<tr>
<td>23/0047</td>
<td>. . . . . . . . . . . . [characterised by the membrane]</td>
</tr>
<tr>
<td>23/0052</td>
<td>. . . . . . . . . . . . [by adsorption in solids]</td>
</tr>
<tr>
<td>23/0057</td>
<td>. . . . . . . . . . . . [characterised by the adsorbent]</td>
</tr>
<tr>
<td>23/0063</td>
<td>. . . . . . . . . . . . [Carbon based materials]</td>
</tr>
<tr>
<td>23/0068</td>
<td>. . . . . . . . . . . . [Zeolites]</td>
</tr>
<tr>
<td>23/0073</td>
<td>. . . . . . . . . . . . [Other molecular sieve materials]</td>
</tr>
<tr>
<td>23/0078</td>
<td>. . . . . . . . . . . . [Temperature swing adsorption]</td>
</tr>
<tr>
<td>23/0084</td>
<td>. . . . . . . . . . . . [in getters]</td>
</tr>
<tr>
<td>23/0089</td>
<td>. . . . . . . . . . . . [by absorption in liquids]</td>
</tr>
<tr>
<td>23/0094</td>
<td>. . . . . . . . . . . . [Combined chemical and physical processing]</td>
</tr>
</tbody>
</table>

**NOTE**

In this group, processing steps are indexed with codes chosen from C01B 2210/0001 - C01B 2210/0025

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**25/00** Phosphorus; Compounds thereof (C01B 6/00, C01B 21/00, C01B 23/00 take precedence; perphosphates C01B 15/16)

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>25/003</td>
<td>. . [Phosphorus]</td>
</tr>
<tr>
<td>25/006</td>
<td>. . [Stabilisation (C01B 25/04 takes precedence)]</td>
</tr>
</tbody>
</table>
Oxygen; Oxides or hydroxides in general; Per-compounds

25/01 . . . . Treating phosphate ores or other raw phosphate materials to obtain phosphorus or phosphorus compounds
25/02 . . . . Preparation of phosphorus
25/023 . . . . of red phosphorus
25/027 . . . . of yellow phosphorus
25/04 . . . . Purification of phosphorus
25/043 . . . . of red phosphorus
25/047 . . . . of yellow phosphorus
25/06 . . . . Hydrogen phosphides
25/08 . . . . Other phosphides
25/081 . . . . {of alkali metals, alkaline-earth metals or magnesium}
25/082 . . . . {of boron, aluminium, gallium or indium}
25/084 . . . . {of boron}
25/085 . . . . {of aluminium}
25/087 . . . . {of gallium or indium}
25/088 . . . . {containing plural metal}
25/10 . . . . Halides or oxyhalides of phosphorus
25/12 . . . . Oxides of phosphorus
25/14 . . . . Sulfur, selenium, or tellurium compounds of phosphorus
25/16 . . . . Oxacids of phosphorus; Salts thereof (peroxacycids or salts thereof C01B 15/00)
25/161 . . . . {containing at least one phosphorus atom with an oxidation number less than five, other than those mentioned below; Salts thereof}
25/163 . . . . Phosphorous acid; Salts thereof
25/165 . . . . Hypophosphorous acid; Salts thereof
25/168 . . . . Pyrophosphorous acid; Salts thereof
25/18 . . . . Phosphoric acid
25/185 . . . . {Preparation neither from elemental phosphorus or phosphoric anhydride nor by reacting phosphate-containing material with an acid, e.g. by reacting phosphate-containing material with an ion-exchange resin or an acid salt used alone}
25/20 . . . . Preparation from elemental phosphorus or phosphoric anhydride
25/22 . . . . Preparation by reacting phosphate-containing material with an acid, e.g. wet process
25/2204 . . . . {Arrangements of vessels used in reacting phosphate-containing material in wet process}
25/2208 . . . . {with an acid or a mixture of acids other than sulfuric acid}
25/2212 . . . . {with hydrochloric acid or hydrogen chloride in aqueous medium}
25/2216 . . . . {with nitric acid or nitrous vapours in aqueous medium}
25/222 . . . . with sulfuric acid, a mixture of acids mainly consisting of sulfuric acid or a mixture of compounds forming it in situ, e.g. a mixture of sulfur dioxide, water and oxygen
25/223 . . . . only one form of calcium sulfate being formed
25/2235 . . . . {Anhydrite processes}
25/225 . . . . {Dihydrate process}
25/226 . . . . {Hemihydrate process}
25/228 . . . . one form of calcium sulfate being formed and then converted to another form
25/2285 . . . . {Dihydrate-anhydrite or hemihydrate-anhydrite process}
25/229 . . . . {Hemihydrate-dihydrate process}
25/2295 . . . . {the conversion being performed in one or more vessels different from those used for reaction after separation of phosphoric acid}
25/231 . . . . Dihydrate-hemihydrate process
25/232 . . . . Preparation by reacting phosphate containing material with concentrated sulfuric acid and subsequently lixiviating the obtained mass, e.g. clinker process
25/234 . . . . Purification; Stabilisation; Concentration (purification concomitant with preparation C01B 25/22; preparation involving solvent-solvent extraction C01B 25/46)
25/2343 . . . . {Concentration concomitant with purification, e.g. elimination of fluorine}
25/2346 . . . . {Concentration}
25/235 . . . . Clarification; Stabilisation to prevent post-precipitation of dissolved impurities
25/237 . . . . Selective elimination of impurities {C01B 25/2343 takes precedence}
25/2372 . . . . {Anionic impurities, e.g. silica or boron compounds}
25/2375 . . . . {Fluoride or fluosilicate anion}
25/2377 . . . . {Sulfate}
25/238 . . . . Cationic impurities {, e.g. arsenic compounds}
25/24 . . . . Condensed phosphoric acids
25/26 . . . . Phosphates (perphosphates C01B 15/16)
25/265 . . . . {General methods for obtaining phosphates}
25/28 . . . . Ammonium phosphates
25/30 . . . . Alkali metal phosphates
25/301 . . . . {Preparation from liquid orthophosphoric acid or from an acid solution or suspension of orthophosphates (using ion-exchangers C01B 25/30)}
25/303 . . . . {with elimination of impurities}
25/305 . . . . {Preparation from phosphorus-containing compounds by alkaline treatment}
25/306 . . . . {from phosphates}
25/308 . . . . {Methods for converting an alkali metal orthophosphate into another one; Purification; Decolorasing; Dehydrating; Drying}
25/32 . . . . Phosphates of magnesium, calcium, strontium, or barium
25/321 . . . . {Methods for converting an alkaline earth metal ortho-orthophosphate into another orthophosphate (by reaction, e.g. of phosphate rock with phosphoric acid C01B 25/322)}
25/322 . . . . {Preparation by neutralisation of orthophosphoric acid}
25/324 . . . . {Preparation from a reaction solution obtained by acidifying with an acid other than orthophosphoric acid}
25/325 . . . . {Preparation by double decomposition}
25/327 . . . . {After-treatment (increasing the phosphate content of ores C01B 25/32)}
25/328 . . . . {Defluorination during or after the preparation}
25/34 . . . . Magnesium phosphates
25/36 . . . . Aluminium phosphates
25/37 . . . . Phosphates of heavy metals
Oxygen; Oxides or hydroxides in general; Per-compounds

25/372 . . . . [of titanium, vanadium, zirconium, niobium, hafnium or tantalum]
25/375 . . . . [of iron]
25/377 . . . . [of manganese]
25/38 . . . . Condensed phosphates
25/385 . . . . [of alkaline-earth metals or magnesium]
25/39 . . . . of alkali metals
25/395 . . . . [Preparation and dehydrating]
25/40 . . . . Polyphosphates
25/405 . . . . [of ammonium]
25/41 . . . . . . . . of alkali metals
25/412 . . . . . . . . [Preparation from alkali metal orthophosphates]
25/414 . . . . . . . . [Apparatus]
25/416 . . . . . . . . [Pure alkali metal polyphosphates from impure starting materials]
25/418 . . . . . . . . [After-treatment]
25/42 . . . . Pyrophosphates
25/425 . . . . [of alkali metals]
25/44 . . . . Metaphosphates
25/445 . . . . [of alkali metals]
25/45 . . . . containing plural metal, or metal and ammonium
25/451 . . . . [containing metal and ammonium]
25/453 . . . . [having molecular-sieve properties]

**WARNING**

Group C01B 25/453 is no longer used for the classification of new documents from May, 1995. The backlog of this groups is continuously being reclassified to the appropriate subgroups of C01B 37/00 and C01B 39/00.

25/455 . . . . containing halogen [completely halogenated alkali metal phosphates C01D, e.g. lithium hexafluorophosphate C01D 15/005]
25/4555 . . . . [Hypochlorite-phosphate double salts, e.g. 4(Na3PO41H2O), NaOCl or so-called chlorinated trisodium phosphate]
25/46 . . . . Preparation involving solvent-solvent extraction (solvent extraction in general B01D 11/00)
25/461 . . . . [the phosphoric acid present in the medium obtained after reaction being first extracted from the liquid phase formed or separated then re-extracted as free acid by using water or as a phosphate by using a basic compound (selective extraction of impurities contained in acid C01B 25/237)]

**NOTES**

1. The extracting agent may be diluted with a compound or a mixture of compounds which are not solvents for phosphoric acid, e.g. a hydrocarbon
2. Documents which belong to more than one subgroup of C01B 25/462, C01B 25/466 are classified by a combination, e.g. C01B 25/462 +B4+B8

25/462 . . . . [the extracting agent being alcohol or a mixture of alcohols]
25/463 . . . . [the extracting agent being a ketone or a mixture of ketones]

25/464 . . . . [the extracting agent being an ether or a mixture of ethers]
25/465 . . . . [the extracting agent being an ester or a mixture of esters]
25/466 . . . . [the extracting agent being a nitrogenous solvent or a mixture of nitrogenous solvents such as amines or amides]
25/467 . . . . [the extracting agent being already present during the phosphate-containing material reaction step]
25/468 . . . . [the extraction being performed on the reaction slurry itself, i.e. without separating the acid (C01B 25/232 takes precedence)]

32/00 Carbon; Compounds thereof (C01B 21/00, C01B 23/00 take precedence; percarbonates C01B 15/10; carbon black C09C 1/48)
32/05 Preparation or purification of carbon not covered by groups C01B 32/15, C01B 32/20, C01B 32/25, C01B 32/30
32/10 Carbon fluorides, e.g. [CF]n or [C2F]n (graphite intercalation thereof C01B 32/22)
32/15 Nano-sized carbon materials
32/152 . . . . Fullerenes
32/154 . . . . Preparation
32/156 . . . . After-treatment
32/158 . . . . Carbon nanotubes

**NOTE**

(In groups C01B 32/15 - C01B 32/18, it is desirable to add indexing codes of C01B 2202/00 - C01B 2202/36 for structural aspects or properties of carbon nanotubes.)

32/159 . . . . single-walled
32/16 . . . . Preparation
32/162 . . . . characterised by catalysts
32/164 . . . . involving continuous processes
32/166 . . . . in liquid phase
32/168 . . . . After-treatment
32/17 . . . . Purification
32/172 . . . . Sorting
32/174 . . . . Derivationisation; Solubilisation; Dispersion in solvents
32/176 . . . . Cutting
32/178 . . . . Opening; Filling
32/18 . . . . Nanoonions; Nanoscrolls; Nanohorns; Nanococones; Nanowalls
32/182 . . . . Graphene
32/184 . . . . Preparation
32/186 . . . . by chemical vapour deposition [CVD]
32/188 . . . . by epitaxial growth
32/19 . . . . by exfoliation
32/192 . . . . starting from graphitic oxides
32/194 . . . . After-treatment
32/196 . . . . Purification
32/198 . . . . Graphene oxide
32/20 . . . . Graphite

**NOTE**

(In groups C01B 32/20 - C01B 32/196, it is desirable to add indexing codes of C01B 2204/00 - C01B 2204/32 for structural aspects or properties of graphene.)
Oxygen; Oxides or hydroxides in general; Per-compounds

32/205 . . . Preparation
32/21 . . . After-treatment
32/215 . . . Purification; Recovery or purification of graphite formed in iron making, e.g. kish graphite
32/22 . . . Intercalation
32/225 . . . . Expansion; Exfoliation
32/23 . . . Oxidation
32/25 . Diamond
32/26 . Preparation (by using ultra-high pressure
B011 3/06; by crystal growth C30B 29/04)
32/28 . . . After-treatment, e.g. purification, irradiation, separation or recovery
32/30 . Active carbon
32/306 . . . with molecular sieve properties
32/312 . Preparation
32/318 . . . characterised by the starting materials
32/324 . . . from waste materials, e.g. tyres or spent sulfite pulp liquor
32/33 . . . from distillation residues of coal or petroleum; from petroleum acid sludge
32/336 . . . characterised by gaseous activating agents
32/342 . . . characterised by non-gaseous activating agents
32/348 . . . . Metal compounds
32/354 . . . After-treatment
32/36 . Reactivation or regeneration
32/366 . . . by physical processes, e.g. by irradiation, by using electric current passing through carbonaceous feedstock or by using recyclable inert heating bodies
32/372 . . . Coating; Grafting; Microencapsulation
32/378 . . . Purification
32/382 . . . [Making shaped products, e.g. fibres, spheres, membranes or foam]
32/384 . . . Granulation

NOTE
In this group, the term "granulation" also covers methods of preparation of active carbon using carbonaceous precursors per se and binders, e.g. pitch.

32/39 . . . Apparatus for the preparation thereof
32/40 . Carbon monoxide
32/50 . Carbon dioxide
32/55 . . Solidifying
32/60 . Preparation of carbonates or bicarbonates in general (of percarbonates C01B 15/10; of specific carbonates or bicarbonates according to the cation C01B-C01G)
32/70 . Compounds containing carbon and sulfur, e.g. thiophosphene
32/72 . . Carbon disulfide
32/75 . . . Preparation by reacting sulfur or sulfur compounds with hydrocarbons
32/77 . . Carbon oxysulfide
32/80 . Phosphene
32/90 . Carbides
32/907 . . Oxycarbides; Sulfo carbides; Mixture of carbides
32/914 . . Carbides of single elements
32/921 . . . Titanium carbide
32/928 . . . Carbides of actinides
32/935 . . . Carbides of alkali metals, strontium, barium or magnesium
32/942 . . . Calcium carbide
32/949 . . . Tungsten or molybdenum carbides
32/956 . . . Silicon carbide
32/963 . . . Preparation from compounds containing silicon
32/97 . . . . Preparation from SiO or SiO2
32/977 . . . . Preparation from organic compounds containing silicon
32/984 . . . . Preparation from elemental silicon
32/991 . . . . Boron carbide
33/00 Silicon; Compounds thereof (C01B 6/00,)
C01B 21/00, C01B 23/00 take precedence; persilicates C01B 15/14; carbides C01B 32/956)
33/02 . . Silicon (forming single crystals or homogeneous polycrystalline material with defined structure C30B)
33/021 . . . Preparation (chemical coating from the vapour phase C23C 16/00)
33/023 . . . . by reduction of silica or [free] silica-containing material
33/025 . . . . with carbon or a solid carbonaceous material, i.e. carbo-thermal process
33/027 . . . . by decomposition or reduction of gaseous or vapourised silicon compounds other than silica or silica-containing material
33/029 . . . . by decomposition of monosilane
33/03 . . . . by decomposition of silicon halides or halosilanes or reduction thereof with hydrogen as the only reducing agent
33/031 . . . . . by decomposition of silicon tetraiodide
33/033 . . . . by reduction of silicon halides or halosilanes with a metal or a metallic alloy as the only reducing agents
33/035 . . . . by decomposition or reduction of gaseous or vapourised silicon compounds in the presence of heated filaments of silicon, carbon or a refractory metal, e.g. tantalum or tungsten, or in the presence of heated silicon rods on which the formed silicon is deposited, a silicon rod being obtained, e.g. Siemens process
33/037 . . . Purification (by zone-melting C30B 13/00)
33/039 . . . . by conversion of the silicon into a compound, optional purification of the compound, and reconversion into silicon
33/04 . Hydrides of silicon
33/043 . . . [Monosilane]
33/046 . . . [Purification]
33/06 . Metal silicides (alloys C22)
33/08 . Compounds containing halogen
33/10 . . Compounds containing silicon, fluorine, and other elements
33/103 . . . [Fluorsilicic acid; Salts thereof]
33/107 . . Halogenated silanes
33/10705 . . . [Tetrafluoride]
33/1071 . . . . [Tetrachloride, trichlorosilane or siliconchloroform, dichlorosilane, monochlorosilane or mixtures thereof]
33/10715 . . . . [prepared by reacting chlorine with silicon or a silicon-containing material]
33/10721 . . . . [with the preferential formation of tetrachloride]
33/10726 . . . . [from silicon]
Oxygen; Oxides or hydroxides in general; Per-compounds

33/10731 . . . . . . . (with the preferential formation of trichlorosilane)
33/10736 . . . . . . . {from silicon}
33/10742 . . . . . . . [prepared by hydrochlorination of silicon or of a silicon-containing material]
33/10747 . . . . . . . (with the preferential formation of tetrachloride)
33/10752 . . . . . . . {from silicon}
33/10757 . . . . . . . (with the preferential formation of trichlorosilane)
33/10763 . . . . . . . {from silicon}
33/10768 . . . . . . . [Tetrabromide; Tetraiodide]
33/10773 . . . . . . . {Halogenated silanes obtained by disproportionation and molecular rearrangement of halogenated silanes}
33/10778 . . . . . . . {Purification}
33/10784 . . . . . . . {by adsorption}
33/10789 . . . . . . . {by the adsorbing material being formed in situ, e.g. by partial hydrolysis}
33/10794 . . . . . . . {by forming addition compounds or complexes, the reactant being possibly contained in an adsorbent}
33/113 . . . . . . . Silicon oxides; Hydrates thereof (preparing monoxide by reduction of siliceous material C01B 33/182)
33/12 . . . . . . . Silica; Hydrates thereof, e.g. lepidoic silicic acid
33/122 . . . . . . . {Lepidoic silicic acid}
33/124 . . . . . . . {Preparation of adsorbing porous silica not in gel form and not finely divided, i.e. silicon skeletons, by acidic treatment of siliceous materials}
33/126 . . . . . . . {Preparation of silica of undetermined type}
33/128 . . . . . . . {by acidic treatment of aqueous silicate solutions}
33/14 . . . . . . . Colloidal silica, e.g. dispersions, gels, sols
33/141 . . . . . . . Preparation of hydrosols or aqueous dispersions
33/1412 . . . . . . . {by oxidation of silicon in basic medium}
33/1415 . . . . . . . {by suspending finely divided silica in water}
33/1417 . . . . . . . {an aqueous dispersion being obtained}
33/142 . . . . . . . {by acidic treatment of silicates}
33/143 . . . . . . . {of aqueous solutions of silicates}
33/1435 . . . . . . . {using ion exchangers}
33/145 . . . . . . . Preparation of hydroorganosols, organosols or dispersions in an organic medium
33/146 . . . . . . . {After-treatment of sols (preparation of hydroorganosols, organosols or dispersions in an organic medium C01B 33/141); preparation of hydroorganosols, organosols or dispersions in an organic medium from hydrosols (organosols or aqueous dispersions C01B 33/145)}
33/1465 . . . . . . . {"Build-up" of particles using only one sol and a "heel" consisting or not of the sol}
33/148 . . . . . . . Concentration; Drying; Dehydration; Stabilisation; Purification (C01B 33/1465 takes precedence)
33/1485 . . . . . . . {Stabilisation, e.g. prevention of gelling; Purification}
33/149 . . . . . . . Coating
Oxygen; Oxides or hydroxides in general; Per-compounds

33/2815 . . . . (of type A (UNION CARBIDE trade name; corresponds to GRACE's types Z-12 or Z-12L))
33/2823 . . . . . (from aqueous solutions of an alkali metal aluminate and an alkali metal silicate excluding any other source of alumina or silica)
33/283 . . . . . (from a reaction mixture containing at least one aluminium silicate or aluminosilicate of a clay-type, e.g. kaolin or metakaolin or its exotherm modification or aliphane (containing a single clay substantially chemically modified with an acid, i.e. beyond the activation state C01B 33/2815))
33/2838 . . . . . (of fayalite type, or type X or Y (UNION CARBIDE trade names; correspond to GRACE's types Z-14 and Z-14HS, respectively))
33/2846 . . . . . (of type X)
33/2853 . . . . . (of type Y)
33/2861 . . . . . (of mordenite type, e.g. pilolite or dachiardite)
33/2869 . . . . . (of other types characterised by an X-ray spectrum and a definite composition)
33/2876 . . . . . (from a reacting mixture containing an amine or an organic cation, e.g. a quaternary onium cation-ammonium, phosphonium, stibonium)
33/2884 . . . . . (the aluminium or the silicon in the network being partly replaced)
33/2892 . . . . . (containing an element or a compound occluded in the pores of the network, e.g. an oxide already present in the starting reaction mixture)
33/32 . . . . Alkali metal silicates (C01B 33/24), C01B 33/26 take precedence
33/325 . . . . [After-treatment, e.g. purification or stabilisation of solutions, granulation; Dissolution; Obtaining solid silicate, e.g. from a solution by spray-drying, flashing off water or adding a coagulant]

NOTE
In this group, obtaining solid silicate, e.g. as a hydrate of a crystalline silicate, from a solution or a hydrate melt by heating or cooling with or without seeding, is not considered as after-treatment, but classified in group C01B 33/22
33/36 . . . . having base-exchange properties but not having molecular sieve properties (regeneration thereof B01J 49/00)
33/38 . . . . Layered base-exchange silicates, e.g. clays, micas or alkali metal silicates of kenyaite or magadiite type (activation of naturally occurring clays B01J 20/12; pillared layered base-exchange silicates B01J 29/049)
33/40 . . . . 
33/405 . . . . (not containing aluminium)
33/42 . . . . 
33/425 . . . . (not containing aluminium)
33/44 . . . . Products obtained from layered base-exchange silicates by ion-exchange with organic compounds such as ammonium, phosphonium or sulfonium compounds or by intercalation of organic compounds, e.g. organom clay material
33/46 . . . . Amorphous silicates, e.g. so-called "amorphous zeolites" (crystalline zeolites C01B 39/00)

35/00 Boron; Compounds thereof (monoborane, diborane, metal borohydrides or addition complexes thereof C01B 6/00; perborates C01B 15/12; binary compounds with nitrogen C01B 21/06; compounds of noble gases C01B 23/0005; phosphides C01B 25/08; carbides C01B 32/991; alloys containing boron C22)
35/02 . . Boron; Borides
35/023 . . [Boron]
35/026 . . [Higher boron hydrides, i.e. containing at least three boron atoms]
35/04 . . Metal borides
35/06 . . Boron halogen compounds
35/061 . . . . [Halides]
35/063 . . . . [Tetrafluoboric acid; Salts thereof]
35/065 . . . . [Tetrafluoboric acid]
35/066 . . . . [Alkaline metal tetrafluoborates]
35/068 . . . . [Halogenated hydrides]
35/08 . . Compounds containing boron and nitrogen, phosphorus, oxygen, sulfur, selenium or tellurium
35/10 . . . . Compounds containing boron and oxygen (C01B 35/06 takes precedence)
35/1009 . . . . [having molecular-sieve properties]
35/1018 . . . . [Carbonyl] compounds derived from boron hydrides
35/1027 . . . . [Oxides]
35/1036 . . . . [Boric anhydride]
35/1045 . . . . [Oxyacids]
35/1054 . . . . [Orthoboric acid]
35/1063 . . . . [Preparation from boron ores or borates using acids or salts]
35/1072 . . . . . . [by means of ammonia-carbon dioxide]
35/1081 . . . . [Preparation by working up other natural sources, e.g. seawater]
35/109 . . . . . . [Purification; Separation; Concentration]
35/12 . . . . Borates (C01B 35/1063 takes precedence)
35/121 . . . . . . [of alkali metal]
35/122 . . . . . . [Sodium tetraborates; Hydrates thereof, e.g. borax]
35/123 . . . . [Preparation from boron ores or other borates]
35/124 . . . . [Preparation by working up natural brines, e.g. seawater]
35/125 . . . . [Purification; Concentration; Dehydration; Stabilisation; Other after-treatment]
35/126 . . . . . . [of alkaline-earth metals, beryllium, aluminium or magnesium]
35/127 . . . . . . [of heavy metals]
35/128 . . . . . . [containing plural metal or metal and ammonium]
35/14 . . . . Compounds containing boron and nitrogen, phosphorus, sulfur, selenium or tellurium
35/143 . . . . [Phosphates]
Compounds characterised primarily by their physical or chemical properties, rather than by their chemical constitution

37/00 Compounds having molecular sieve properties but not having base-exchange properties

NOTE
Compounds classified in main group C01B 37/00 are also classified in other groups of class C01 according to their composition

37/002 . . . [Metallophosphates not containing aluminium, e.g. gallophosphates or silicogallopahphates]
37/005 . . . [Silicates, i.e. so-called metallosilicilites or metallozeolosilites]
37/007 . . . [Borosilicates]
37/02 . . . Crystalline silica-polymerohs, e.g. silicilites [dealkalumized aluminosilicate zeolites]
37/04 . . . Aluminophosphates (APO compounds)
37/06 . . . Aluminophosphates containing other elements, e.g. metals, boron
37/065 . . . {the other elements being metals only}
37/08 . . . Silicoaluminophosphates (SAPO compounds) {e.g. CoSAPO}

39/00 Compounds having molecular sieve and base-exchange properties, e.g. crystalline zeolites; Their preparation; After-treatment, e.g. ion-exchange or dealumination (treatment to modify the sorption properties, e.g. shaping using a binder, B01J 20/10; treatment to modify the catalytic properties, e.g. combination of treatments to make the zeolites appropriate to their use as a catalyst, B01J 29/03; treatment to improve the ion-exchange properties B01J 39/14; regeneration or reactivation of ion-exchange properties B01J 49/00; preparation of stabilised suspensions used in detergents C11D 3/12)

NOTES
1. In this group, the following term is used with the meaning indicated:
   i. “zeolite” means:
      a. crystalline aluminosilicates with base-exchange and molecular sieve properties, having three dimensional, microporous lattice framework structure of tetrahedral oxide units;
      b. 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.
2. Compounds classified in main group C01B 39/00 are also classified in other groups of class C01 according to their composition
39/02 . . . Crystalline aluminosilicate zeolites; Isomorphous compounds thereof; Direct preparation thereof; Preparation thereof starting from a reaction mixture containing a crystalline zeolite of another type, or from preformed reactants; After-treatment thereof

39/023 . . . {Preparation of physical mixtures or intergrowth products of zeolites chosen from group C01B 39/04 or two or more of groups C01B 39/14 - C01B 39/48}
39/026 . . . [After-treatment]
39/04 . . . using at least one organic template directing agent, e.g. an ionic quaternary ammonium compound or an aminated compound
39/06 . . . Preparation of isomorphous zeolites characterised by measures to replace the aluminium or silicon atoms in the lattice framework by atoms of other elements, i.e. by direct or secondary synthesis
39/065 . . . {Galloaluminosilicates; Group IVB-metalloaluminosilicates; Ferroaluminosilicates}
39/08 . . . the aluminium atoms being wholly replaced
39/082 . . . . . . . . . {Gallosilicates}
39/085 . . . . . . . . . {Group IVB-metallosilicates}
39/087 . . . . . . . . . {Ferroaluminosilicates}
39/10 . . . the replacing atoms being [at least] phosphorus atoms
39/12 . . . the replacing atoms being [at least] boron atoms
39/14 . . . Type A
39/145 . . . . {using at least one organic template directing agent}
39/16 . . . from aqueous solutions of an alkali metal aluminate and an alkali metal silicate excluding any other source of alumina or silica but seeds ({C01B 39/145 takes precedence})
39/18 . . . from a reaction mixture containing at least one aluminosilicate or aluminosilicate of a clay type, e.g. kaolin or metakaolin or its exotherm modification or allophane ((C01B 39/145 takes precedence))
39/20 . . . Faujaisite type, e.g. type X or Y
39/205 . . . {using at least one organic template directing agent; Hexagonal faujaisite; Intergrowth products of cubic and hexagonal faujaisite}
39/22 . . . Type X ((C01B 39/205 takes precedence))
39/24 . . . Type Y ((C01B 39/205 takes precedence))
39/26 . . . Mordenite type ((C01B 39/023, C01B 39/026, C01B 39/06 takes precedence))
39/265 . . . {using at least one organic template directing agent}
39/28 . . .Phillipsite or harmotome type ((C01B 39/023, C01B 39/026, C01B 39/06 takes precedence))
39/30 . . . Erionite or offretite type, e.g. zeolite T
39/305 . . . {using at least one organic template directing agent}
39/32 . . . Type L
39/34 . . . Type ZSM-4
39/36 . . . Pentasil type, e.g. types ZSM-5, ZSM-8 or ZSM-11
39/365 . . . {Type ZSM-8; Type ZSM-11; ZSM 5/11 intermediate}
39/38 . . . Type ZSM-5
39/40 . . . . . . . {using at least one organic template directing agent}
39/42 . . . Type ZSM-12
39/44 . . . Ferrierite type, e.g. types ZSM-21, ZSM-35 or ZSM-38
39/445 . . . {using at least one organic template directing agent}
Compounds characterised primarily by their physical or chemical properties, rather than by their chemical constitution

39/46 . . . Other types characterised by their X-ray diffraction pattern and their defined composition ((C01B 39/023, C01B 39/026, C01B 39/06 take precedence))

39/48 . . . using at least one organic template directing agent

39/50 . . . Zeolites wherein inorganic bases or salts occlude channels in the lattice framework, e.g. sodalite, cancrinite, nosean, haunyite (ultramarine C09C 1/32)

39/52 . . . Sodalites

39/54 . . . Phosphates, e.g. APO or SAPO compounds

NOTE

Phosphates having either a poorly defined or a weak base-exchange capacity such as MAPO's, SAPO's or BAPO's are classified in C01B 37/00

2203/00 Integrated processes for the production of hydrogen or synthesis gas (reactors or details thereof B01J 2208/00 - B01J 2219/00)

2203/02 . . . Processes for making hydrogen or synthesis gas

2203/0205 . . . containing a reforming step

2203/0211 . . . containing a non-catalytic reforming step

2203/0216 . . . containing a non-catalytic steam reforming step

2203/0222 . . . containing a non-catalytic carbon dioxide reforming step

2203/0227 . . . containing a catalytic reforming step

2203/0233 . . . the reforming step being a steam reforming step

2203/0238 . . . the reforming step being a carbon dioxide reforming step

2203/0244 . . . the reforming step being an autothermal reforming step, e.g. secondary reforming processes

2203/025 . . . containing a partial oxidation step

2203/0255 . . . containing a non-catalytic partial oxidation step

2203/0261 . . . containing a catalytic partial oxidation step [CPO]

2203/0266 . . . containing a decomposition step

2203/0272 . . . containing a non-catalytic decomposition step

2203/0277 . . . containing a catalytic decomposition step

2203/0283 . . . containing a CO-shift step, i.e. a water gas shift step

2203/0288 . . . containing two CO-shift steps

2203/0294 . . . containing three or more CO-shift steps

2203/0304 . . . containing a purification step for the hydrogen or the synthesis gas

2203/0405 . . . Purification by membrane separation

2203/041 . . . In-situ membrane purification during hydrogen production

2203/0415 . . . Purification by absorption in liquids

2203/042 . . . Purification by adsorption on solids

2203/0425 . . . In-situ adsorption process during hydrogen production

2203/043 . . . Regenerative adsorption process in two or more beds, one for adsorption, the other for regeneration

2203/0435 . . . Catalytic purification

2203/044 . . . Selective oxidation of carbon monoxide

2203/0445 . . . Selective methanation

2203/045 . . . Purification by catalytic desulphurisation

2203/0455 . . . Purification by non-catalytic desulphurisation

2203/046 . . . Purification by cryogenic separation

2203/0465 . . . Composition of the impurity

2203/047 . . . the impurity being carbon monoxide

2203/0475 . . . the impurity being carbon dioxide

2203/048 . . . the impurity being an organic compound

2203/0485 . . . the impurity being a sulfur compound

2203/049 . . . the impurity being carbon

2203/0495 . . . the impurity being water

2203/0496 . . . Purification with chemical processes

2203/061 . . . Methanol production

2203/062 . . . Hydrocarbon production, e.g. Fischer-Tropsch process

2203/063 . . . Refinery processes

2203/065 . . . using hydrotreating, e.g. hydrogenation, hydrodesulphurisation

2203/066 . . . with fuel cells
the reforming process taking place in the fuel cell
Ammonia synthesis
Methods of heating or cooling
Methods of heating the process for making hydrogen or synthesis gas
by combustion of fuel
Heating by flames
the fuel containing hydrogen
at least part of the fuel being a recyle stream
Heating by indirect heat exchange with hot fluids, other than combustion gases, product gases or non-combustible exothermic reaction product gases
by heat exchange with exothermic reactions, other than by combustion of fuel
the non-combustible exothermic reaction being another reforming reaction as defined in groups C01B 2203/02 - C01B 2203/0294
by electric heating
by electromagnetic heating
by plasma
by combination of different heating methods
Methods of cooling
by direct injection of fluid
by indirect heat exchange
by evaporation of a fluid
Generation of steam
Catalysts for performing the hydrogen forming reactions
Arrangement or shape of catalyst
Packed bed of catalytic structures, e.g. particles, packing elements
characterised by the form of the structure
Catalysts in the form of a monolith or honeycomb
Catalysts in the form of a foam
Catalyst coated on equipment surfaces, e.g. reactor walls
Composition of the catalyst
Group VIII metal catalysts
Nickel or cobalt catalysts
Nickel catalysts
Platinum group metal catalysts
Platinum catalysts
Copper or zinc-based catalysts
Composition of support materials
Non-supported catalysts
Promoters or activators
Feeding the process for making hydrogen or synthesis gas
Composition of the feed
Organic compounds or organic mixtures used in the process for making hydrogen or synthesis gas
Alcohols
Methanol
Ethanol
Hydrocarbons
Natural gas or methane
Higher hydrocarbons
Cyclic or aromatic hydrocarbons
Pre-treatment of the feed
Catalytic pre-treatment of the feed
Catalytic desulphurisation
Mixing of different feed components
using static mixers
Evaporation of one or more of the different feed components
Evaporation by heat exchange with hot process stream
Details of the flowsheet
At least two reforming, decomposition or partial oxidation steps in parallel
At least two reforming, decomposition or partial oxidation steps in series
Three or more reforming, decomposition or partial oxidation steps in series
At least two purification steps in parallel
At least two purification steps in series
Three or more purification steps in series
involving a recycle stream to the feed of the process for making hydrogen or synthesis gas
Controlling the process
Starting up the process
Shutting down the process
Controlling the temperature
Measuring the temperature
Adjusting the temperature
Controlling the pressure
Measuring the pressure
Adjusting the pressure
Controlling the product
Controlling the amount of the product
Measuring the amount of product
the product being hydrogen
the product being carbon monoxide
the product being carbon dioxide
Controlling the composition of the product
Measuring the composition of the product
Adjusting the composition of the product
Control based on demand of downstream process
Controlling the feed
Adjusting the feed of the combustion
Aspect of integrated processes for the production of hydrogen or synthesis gas not covered by groups C01B 2203/02 - C01B 2203/1695
Several process steps of C01B 2203/02 - C01B 2203/08 integrated into a single apparatus
Energy production
Carbon dioxide sequestration
Structure or properties of graphene
Single layer graphene
Specific amount of layers or specific thickness
Graphene nanoribbons
characterized by their width or by their aspect ratio
Graphene characterized by its properties
Electronic properties
Thermal properties
Mechanical properties
Solid content in solvents
Purity
Size or surface area

Purification or separation of specific gases

Separation or purification processing

Chemical processing

by oxidation

by reduction

by complexation

Physical processing

by making use of membranes

characterised by the membrane

by adsorption in solids

characterised by the adsorbent

Carbon-based materials

Zeolites

Other molecular sieve materials

Temperature swing adsorption

in getters

by absorption in liquids

Isotopes of the specific gas

Separation of the specific gas from gas mixtures containing a minor amount of this specific gas

Obtaining noble gases

Helium

Neon

Argon

Krypton

Xenon

Radon

Separation of a mixture of noble gases

Making ultrapure specific gas

Impurity removed

Oxygen

Nitrogen

Air

Carbon monoxide

Carbon dioxide

Hydrogen

Hydrogen halides

Hydrogen fluoride

Hydrogen chloride

Hydrogen bromide

Hydrogen iodide

Water

Hydrogen sulfide

Ammonia

Hydrogen cyanide

Organic compounds

Hydrocarbons

Sulfur oxides

Sulfur halides

Nitrogen oxides

Nitrogen halides

Noble gases

Helium

Neon

Argon

Krypton

Xenon

Radon

Peroxides

Hydrogen peroxide

Ozone

Metals or metal compounds

Metals

Metal hydrides

Other impurities