

# CPC COOPERATIVE PATENT CLASSIFICATION

## C CHEMISTRY; METALLURGY

(NOTES omitted)

### METALLURGY

## C22 METALLURGY; FERROUS OR NON-FERROUS ALLOYS; TREATMENT OF ALLOYS OR NON-FERROUS METALS

## C22B PRODUCTION AND REFINING OF METALS (electrolytic C25); PRETREATMENT OF RAW MATERIALS

### NOTE

In this subclass, groups for obtaining metals include obtaining the metals by non-metallurgical processes, and obtaining metal compounds by metallurgical processes, {as far as specifically indicated in the relevant groups} . Thus, for example, group [C22B 11/00](#) covers the production of silver by reduction of ammoniacal silver oxide in solution, and group [C22B 17/00](#) includes the production of cadmium oxide by a metallurgical process. Furthermore, although compounds of arsenic and antimony are classified in [C01G](#), production of the elements themselves is included in [C22B](#), as well as the production of their compounds by metallurgical processes.

### WARNINGS

- The following IPC groups are not in the CPC scheme. The subject matter for these IPC groups is classified in the following CPC groups:
 

<a href="#">C22B 3/26 - C22B 3/40</a>	covered by	<a href="#">C22B 3/0005</a>
<a href="#">C22B 9/187 - C22B 9/193</a>	covered by	<a href="#">C22B 9/18</a>
<a href="#">C22B 9/21</a>	covered by	<a href="#">C22B 9/20</a>
<a href="#">C22B 15/02</a>	covered by	<a href="#">C22B 15/0032</a>
<a href="#">C22B 15/04</a>	covered by	<a href="#">C22B 15/0036</a>
<a href="#">C22B 15/06</a>	covered by	<a href="#">C22B 15/0041</a> , <a href="#">C22B 15/0043</a>
<a href="#">C22B 15/14</a>	covered by	<a href="#">C22B 15/006</a>
- 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.

- 1/00 Preliminary treatment of ores or scrap (furnaces, sintering apparatus F27B)**
- 1/005 . {Preliminary treatment of scrap ([C22B 1/02 - C22B 1/26 take precedence](#))}
- 1/02 . Roasting processes ([C22B 1/16 takes precedence](#))
- 1/04 . . Blast roasting
- 1/06 . . Sulfating roasting
- 1/08 . . Chloridising roasting
- 1/10 . . in fluidised form
- 1/11 . Removing sulfur, phosphorus or arsenic other than by roasting
- 1/14 . Agglomerating; Briquetting; Binding; Granulating
- 1/16 . . Sintering; Agglomerating
- 1/18 . . . in sinter pots
- 1/20 . . . in sintering machines with movable grates
- 1/205 . . . . {regulation of the sintering process}
- 1/212 . . . in tunnel furnaces
- 1/214 . . . in shaft furnaces
- 1/216 . . . in rotary furnaces
- 1/22 . . . in other sintering apparatus
- 1/24 . . Binding; Briquetting {; Granulating}
- 1/2406 . . . {pelletizing}
- 1/2413 . . . {enduration of pellets}
- 1/242 . . . with binders
- 1/243 . . . . inorganic

- 1/244 . . . . organic
- 1/245 . . . . with carbonaceous material for the production of coked agglomerates
- 1/248 . . . of metal scrap or alloys
- 1/26 . Cooling of roasted, sintered, or agglomerated ores

## 3/00 Extraction of metal compounds from ores or concentrates by wet processes

### NOTE

This group covers methods directed to the extraction of three or more metals.

For the recovery of one or two metals, see the other groups of this subclass concerning these metals

- 3/0001 . {Leaching of ores not used, see subgroups}
- 3/0002 . . {Leaching with an ammoniacal liquor or with a hydroxide of an alkali or an alkaline earth metal}

### WARNING

Group [C22B 3/0002](#) is no longer used for the classification of new documents from May 1st, 2005. The backlog of this group is being continuously transferred to the relevant groups of [C22B](#)

3/0004	. {Treatment or purification of solutions, e.g. obtained by leaching ( <a href="#">C22B 3/04 takes precedence</a> )}	3/0047	. . . . . {of the phosphine or phosphane (PH <sub>3</sub> ) type}
	<b>WARNING</b>	3/0048	. . . . . {Primary (RPH <sub>2</sub> ) compounds}
	Not used, see subgroups	3/005	. . . . . {Secondary (R <sub>2</sub> PH) compounds}
3/0005	. . {by liquid-liquid extraction using organic compounds, e.g. acyclic or carbocyclic compounds, heterocyclic compounds, organo-metallic compounds, alcohols, ethers, or the like ( <a href="#">C22B 3/205 takes precedence</a> )}	3/0051	. . . . . {Tertiary (R <sub>3</sub> PH) compounds}
3/0006	. . . {using acyclic or carbocyclic compounds}	3/0052	. . . . . {Chalcogenides of phosphine, e.g. (R <sub>3</sub> P=X) type with X = O, S, Se or Te; Oxides, Thio-oxides of phosphine}
3/0008	. . . . {using acyclic or carbocyclic compounds of a single type}	3/0054	. . . . . {of the phosphorane (PH <sub>5</sub> ) type}
3/0009	. . . . . {using alcohols or phenols}	3/0055	. . . . . {of the phosphonium (PR <sub>4</sub> ) type}
3/001	. . . . . {using amines ( <a href="#">amino acids C22B 3/0024</a> )}	3/0056	. . . . . {Mononuclear oxyacids of tervalent phosphorus or their esters(-ite)}
3/0012	. . . . . {using aliphatic amines}	3/0058	. . . . . {Phosphenous (HOPO) type}
3/0013	. . . . . {using aromatic amines}	3/0059	. . . . . {Phosphinous (H <sub>2</sub> POH) type}
3/0014	. . . . . {using amino-alcohols}	3/006	. . . . . {Phosphonous (H <sub>2</sub> P(OH) <sub>2</sub> ) type}
3/0016	. . . . . {using quaternary ammonium}	3/0062	. . . . . {Phosphorous (P(OH) <sub>3</sub> ) type}
3/0017	. . . . . {using oximes}	3/0063	. . . . . {Mononuclear oxyacids of pentavalent phosphorus or their esters(-ate)}
3/0018	. . . . . {using ethers or epoxides}	3/0064	. . . . . {Phosphenic (HOP(O) <sub>2</sub> ) or metaphosphoric type}
3/002	. . . . . {using crown ethers}	3/0066	. . . . . {Phosphinic (H <sub>2</sub> P(O)(OH)) type}
3/0021	. . . . . {using ketones or aldehydes}	3/0067	. . . . . {Phosphonic (H <sub>2</sub> P(O)(OH) <sub>2</sub> ) type}
3/0022	. . . . . {using organic acids ( <a href="#">C22B 3/0031</a> , <a href="#">C22B 3/0035</a> , <a href="#">C22B 3/004 take precedence</a> )}	3/0068	. . . . . {Phosphoric ((O)P(OH) <sub>3</sub> ) type}
3/0024	. . . . . {using acids of the carboxylic type or derivatives thereof, e.g. amino acids, nitriles, amides, hydroxamic acids}	3/007	. . . . . {Thiophosphoric acids or their esters}
3/0025	. . . . . {using oxalic acids}	3/0071	. . . . . {Dinuclear or polynuclear oxyacids and their derivatives}
3/0027	. . . . . {using naphthenic acids}	3/0072	. . . . . {Compounds with phosphorus-nitrogen (P=N) double bonds}
3/0028	. . . . . {using ramified chain carboxylic acids or derivatives thereof, e.g. "versatic" acids}	3/0074	. . . . . {compounds with (P-P) bonds}
3/0029	. . . . . {using cyanic acids or derivatives thereof ( <a href="#">C22B 3/0031</a> , <a href="#">C22B 3/0035</a> , <a href="#">C22B 3/004 take precedence</a> )}	3/0075	. . . . . {compounds with (P-Xn-P) bonds (n, 0, X: other than P), e.g. pyro- or di-}
3/0031	. . . . . {using organic compounds containing sulfur atom(s), e.g. sulfonium ( <a href="#">C22B 3/004 takes precedence</a> )}	3/0077	. . . . . {Cyclic compounds, e.g. aryl-, phenyl-, benzyl-compounds}
3/0032	. . . . {using mixtures of acyclic or carbocyclic compounds of different types ( <a href="#">C22B 3/0035</a> , <a href="#">C22B 3/004 take precedence</a> )}	3/0078	. . . . . {using a mixture of phosphorus-based acid derivatives of different types}
3/0033	. . . . . {using organic acids added to oximes}	3/0079	. . . . . {of the acyclic type}
3/0035	. . . {using heterocyclic compounds ( <a href="#">C22B 3/0018</a> , <a href="#">C22B 3/002</a> and <a href="#">C22B 3/0031 take precedence</a> )}	3/0081	. . . . . {two or more of the phosphine type}
3/0036	. . . . {using heterocyclic compounds of a single type}	3/0082	. . . . . {two or more of the phosphine oxides or sulfides type}
3/0037	. . . . . {using quinoline}	3/0083	. . . . . {two or more of the phosphorane type}
3/0039	. . . . {using a mixture of organic agents wherein one agent at least is a heterocyclic compound ( <a href="#">C22B 3/004 takes precedence</a> )}	3/0085	. . . . . {two or more of the phosphonium type}
3/004	. . . {using organo-metallic compounds or organo compounds of boron, silicon, phosphorus, selenium or tellurim}	3/0086	. . . . . {two or more of the mononuclear oxyacids of tervalent phosphorus or their esters}
3/0041	. . . . {using organo-metallic compounds of a single type}	3/0087	. . . . . {two or more mononuclear oxyacids of quinquevalent phosphorus or their esters}
3/0043	. . . . . {using phosphorus-based acid derivatives}	3/0089	. . . . . {two or more thiophosphoric acids or their esters}
3/0044	. . . . . {of a single type}	3/009	. . . . . {two or more dinuclear or polynuclear oxyacids or their derivatives}
3/0045	. . . . . {Acyclic compounds}	3/0091	. . . . . {combinations of the above}
		3/0093	. . . . . {comprising cyclic compounds only}

- 3/0094 . . . . . {comprising cyclic and acyclic compounds}
- 3/0095 . . . . {using a mixture of organic agents wherein one agent at least is an organo-metallic compound}
- 3/0097 . . . {using a solution of normally solid organic compounds, e.g. dissolved polymers, sugars, or the like}
- 3/0098 . . {by ion exchange extraction or by adsorption on solid substances, e.g. by extraction with solid resins (C22B 3/0097 takes precedence)}

**WARNING**

Group C22B 3/0098 is no longer used for the classification of new documents from May 1st, 2005. The backlog of this group is being continuously transferred to the relevant groups of C22B

- 3/02 . Apparatus therefor
- 3/04 . by leaching (C22B 3/18 takes precedence)
- 3/045 . . {Leaching using electrochemical processes}
- 3/06 . . in inorganic acid solutions {, e.g. with acids generated in situ; in inorganic salt solutions other than ammonium salt solutions}
- 3/065 . . . {Nitric acids or salts thereof}
- 3/08 . . . Sulfuric acid {, other sulfurated acids or salts thereof}
- 3/10 . . . Hydrochloric acid {, other halogenated acids or salts thereof}
- 3/12 . . in inorganic alkaline solutions
- 3/14 . . . containing ammonia or ammonium salts

**WARNING**

Group C22B 3/14 was introduced on May 1st, 2005. This group covers the subject-matter of group C22B 3/0002 which is no longer used for classification of new documents

- 3/16 . . in organic solutions
- 3/1608 . . . {Leaching with acyclic or carbocyclic agents}
- 3/1616 . . . . {Leaching with acyclic or carbocyclic agents of a single type}
- 3/1625 . . . . . {with amines (amino acids C22B 3/165)}
- 3/1633 . . . . . {with oximes}
- 3/1641 . . . . . {with ketones or aldehydes}
- 3/165 . . . . . {with organic acids}
- 3/1658 . . . . {Leaching with acyclic or carbocyclic agents of different types in admixture, e.g. with organic acids added to oximes}
- 3/1666 . . . {Leaching with heterocyclic compounds}
- 3/1675 . . . . {Leaching with a mixture of organic agents wherein one agent at least is a heterocyclic compounds (C22B 3/1683 takes precedence)}
- 3/1683 . . . {Leaching with organo-metallic compounds}
- 3/1691 . . . . {Leaching with a mixture of organic agents wherein at least one agent is an organo-metallic compound}
- 3/18 . with the aid of microorganisms or enzymes, e.g. bacteria or algae
- 3/20 . Treatment or purification of solutions, e.g. obtained by leaching (C22B 3/18 takes precedence)
- 3/205 . . {using adducts or inclusion complexes}

- 3/22 . . by physical processes, e.g. by filtration, by magnetic means, {by thermal decomposition} (C22B 3/0005 takes precedence)
- 3/24 . . . by adsorption on solid substances, e.g. by extraction with solid resins

**WARNING**

Group C22B 3/24 was introduced on May 1st, 2005. This group covers the subject-matter of group C22B 3/0098 which is no longer used for classification of new documents

- 3/42 . . by ion-exchange extraction

**WARNING**

Group C22B 3/42 was introduced on May 1st, 2005. This group covers the subject-matter of group C22B 3/0098 which is no longer used for classification of new documents

- 3/44 . . by chemical processes (C22B 3/0005 - C22B 3/0097 take precedence)
- 3/46 . . . by substitution, e.g. by cementation

#### 4/00 Electrothermal treatment of ores or metallurgical products for obtaining metals or alloys (obtaining iron or steel C21B, C21C)

- 4/005 . {using plasma jets (smelting, remelting, refining of metals using a plasma as heat source C22B 9/22; generating or handling plasma in general H05H 1/00; gas-filled discharge tubes for processing materials in general H01J 37/32)}
- 4/02 . Light metals {(C22B 4/005 takes precedence)}
- 4/04 . Heavy metals {(C22B 4/005 takes precedence)}
- 4/06 . Alloys {(C22B 4/005 takes precedence)}
- 4/08 . Apparatus {(C22B 4/005 takes precedence; } electric heating elements H05B)

#### 5/00 General methods of reducing to metals

- 5/02 . Dry methods {smelting of sulfides or formation of mattes}
- 5/04 . . by aluminium, other metals or silicon
- 5/06 . . by carbides or the like
- 5/08 . . by sulfides; Roasting reaction methods
- 5/10 . . by solid carbonaceous reducing agents
- 5/12 . . by gases
- 5/14 . . . fluidised material
- 5/16 . . with volatilisation or condensation of the metal being produced
- 5/18 . . Reducing step-by-step
- 5/20 . . from metal carbonyls

#### 7/00 Working up raw materials other than ores, e.g. scrap, to produce non-ferrous metals and compounds thereof; {Methods of a general interest or applied to the winning of more than two metals (briquetting of scrap C22B 1/248; preliminary treatment of scrap C22B 1/005)}

- 7/001 . {Dry processes}
- 7/002 . . {by treating with halogens, sulfur or compounds thereof; by carburising, by treating with hydrogen (hydriding)}
- 7/003 . . {only remelting, e.g. of chips, borings, turnings; apparatus used therefor}

- 7/004 . . {separating two or more metals by melting out (liquation), i.e. heating above the temperature of the lower melting metal component(s); by fractional crystallisation (controlled freezing)}
- 7/005 . {Separation by a physical processing technique only, e.g. by mechanical breaking}
- 7/006 . {Wet processes}
- 7/007 . . {by acid leaching}
- 7/008 . . {by an alkaline or ammoniacal leaching}
- 7/009 . {General processes for recovering metals or metallic compounds from spent catalysts (for recovering specific metals [C22B 11/00](#) - [C22B 61/00](#))}
- 7/02 . Working-up flue dust
- 7/04 . Working-up slag
- 9/00 General processes of refining or remelting of metals; Apparatus for electros slag or arc remelting of metals**
- 9/003 . {by induction}
- 9/006 . {with use of an inert protective material including the use of an inert gas}
- 9/02 . Refining by liquating, filtering, centrifuging, distilling, or supersonic wave action {including acoustic waves; ([C22B 9/003](#), [C22B 9/006](#), [C22B 9/05](#), [C22B 9/22](#) take precedence)}
- 9/023 . . {By filtering (filtration of aluminium [C22B 21/066](#))}
- 9/026 . . {by acoustic waves, e.g. supersonic waves}
- 9/04 . Refining by applying a vacuum
- 9/05 . Refining by treating with gases, e.g. gas flushing {also refining by means of a material generating gas in situ}
- 9/055 . . {while the metal is circulating, e.g. combined with filtration}
- 9/10 . with refining or fluxing agents; Use of materials therefor, {e.g. slagging or scorifying agents} ([C22B 9/18](#) takes precedence) { ([C22B 9/006](#) takes precedence)}
- 9/103 . . {Methods of introduction of solid or liquid refining or fluxing agents}
- 9/106 . . {the refining being obtained by intimately mixing the molten metal with a molten salt or slag}
- 9/14 . Refining in the solid state
- 9/16 . Remelting metals ([liquating C22B 9/02](#))
- 9/18 . . Electros slag remelting {([electros slag casting B22D 23/10](#))}
- 9/20 . . Arc remelting
- 9/22 . . with heating by wave energy or particle radiation {(by [acoustic waves C22B 9/026](#))}
- 9/221 . . . {by electromagnetic waves, e.g. by gas discharge lamps}
- 9/223 . . . . {by laser beams ([working by laser beam B23K 26/00](#))}
- 9/225 . . . . {by microwaves}
- 9/226 . . . {by electric discharge, e.g. plasma ([C22B 9/20](#) takes precedence; apparatus therefor [H01J](#), [H05B](#), [H05H](#); chemical reactions with metals in a plasma [C22B 4/005](#))}
- 9/228 . . . {by particle radiation, e.g. electron beams}
- 11/00 Obtaining noble metals**
- 11/02 . by dry processes
- 11/021 . . {Recovery of noble metals from waste materials}
- 11/023 . . . {from pyrometallurgical residues, e.g. from ashes, dross, flue dust, mud, skim, slag, sludge}
- 11/025 . . . {from manufactured products, e.g. from printed circuit boards, from photographic films, paper, or baths}
- 11/026 . . . {from spent catalysts}
- 11/028 . . . . {using solid sorbents, e.g. getters or catchment gauzes}
- 11/04 . {by wet processes ([C22B 3/16](#) takes precedence; treatment or purification of solutions by liquid-liquid extraction [C22B 3/0005](#), by ion exchange or by adsorption [C22B 3/00](#), [C01G](#); [C22B 3/16](#), [C22B 3/0005](#))}
- 11/042 . . {Recovery of noble metals from waste materials}
- 11/044 . . . {from pyrometallurgical residues, e.g. from ashes, dross, flue dust, mud, skim, slag, sludge}
- 11/046 . . . {from manufactured products, e.g. from printed circuit boards, from photographic films, paper or baths}
- 11/048 . . . {from spent catalysts}
- 11/06 . Chloridising
- 11/08 . by cyaniding
- 11/10 . by amalgamating
- 11/12 . . Apparatus therefor
- 13/00 Obtaining lead**
- 13/02 . by dry processes
- 13/025 . . {Recovery from waste materials}
- 13/04 . {by wet processes}
- 13/045 . . {Recovery from waste materials}
- 13/06 . Refining
- 13/08 . . Separating metals from lead by precipitating, e.g. Parkes process
- 13/10 . . Separating metals from lead by crystallising, e.g. by Pattison process
- 15/00 Obtaining copper**
- 15/0002 . {Preliminary treatment}
- 15/0004 . . {without modification of the copper constituent}
- 15/0006 . . . {by dry processes}
- 15/0008 . . . {by wet processes ([by flotation B03D](#))}
- 15/001 . . {with modification of the copper constituent}
- 15/0013 . . . {by roasting}
- 15/0015 . . . . {Oxidizing roasting}
- 15/0017 . . . . {Sulfating or sulfiding roasting}
- 15/0019 . . . . {Chloridizing roasting ([segregation C22B 15/0023](#))}
- 15/0021 . . . {by reducing in gaseous or solid state ([slag reduction C22B 15/0054](#))}
- 15/0023 . . . . {Segregation}
- 15/0026 . {Pyrometallurgy}
- 15/0028 . . {Smelting or converting}
- 15/003 . . . {Bath smelting or converting}
- 15/0032 . . . . {in shaft furnaces, e.g. blast furnaces}
- 15/0034 . . . . {in rotary furnaces, e.g. kaldo-type furnaces}
- 15/0036 . . . . {in reverberatory furnaces}
- 15/0039 . . . . {in electric furnaces}
- 15/0041 . . . . {in converters}
- 15/0043 . . . . . {in rotating converters}
- 15/0045 . . . . {in muffles, crucibles, or closed vessels}
- 15/0047 . . . {flash smelting or converting}
- 15/005 . . . {in a succession of furnaces}
- 15/0052 . . . {Reduction smelting or converting}
- 15/0054 . . {Slag, slime, speiss, or dross treating}
- 15/0056 . . {Scrap treating}



- 15/0058 . . . {Spent catalysts}
- 15/006 . . {working up of molten copper, e.g. refining}
- 15/0063 . {Hydrometallurgy}
- 15/0065 . . {Leaching or slurring (with organic compounds [C22B 3/16](#))}
- 15/0067 . . . {with acids or salts thereof}
- 15/0069 . . . . {containing halogen}
- 15/0071 . . . . {containing sulfur}
- 15/0073 . . . . {containing nitrogen}
- 15/0076 . . . . {Cyanide groups}
- 15/0078 . . . {with ammoniacal solutions, e.g. ammonium hydroxide}
- 15/008 . . . {with non-acid solutions containing salts of alkali or alkaline earth metals}
- 15/0082 . . . {with water}
- 15/0084 . . {Treating solutions (with organic compounds [C22B 3/0004](#))}
- 15/0086 . . . {by physical methods}
- 15/0089 . . . {by chemical methods}
- 15/0091 . . . . {by cementation}
- 15/0093 . . . . {by gases, e.g. hydrogen or hydrogen sulfide}
- 15/0095 . {Process control or regulation methods}
- 15/0097 . . {Sulfur release abatement}
- 17/00 Obtaining cadmium**
- 17/02 . by dry processes
- 17/04 . {by wet processes}
- 17/06 . Refining
- 19/00 Obtaining zinc or zinc oxide**
- 19/02 . Preliminary treatment of ores; Preliminary refining of zinc oxide
- 19/04 . Obtaining zinc by distilling
- 19/06 . . in muffle furnaces
- 19/08 . . in blast furnaces
- 19/10 . . in reverberatory furnaces
- 19/12 . . in crucible furnaces
- 19/14 . . in vertical retorts
- 19/16 . . Distilling vessels
- 19/18 . . . Condensers, Receiving vessels
- 19/20 . Obtaining zinc otherwise than by distilling
- 19/22 . . {with leaching with acids}
- 19/24 . . {with leaching with alkaline solutions, e.g. ammonia}
- 19/26 . . {Refining solutions containing zinc values, e.g. obtained by leaching zinc ores (treatment or purification of solutions by liquid-liquid extraction, by ion exchange or by adsorption [C22B 3/00](#))}
- 19/28 . from muffle furnace residues
- 19/30 . from metallic residues or scraps
- 19/32 . Refining zinc
- 19/34 . Obtaining zinc oxide (purifying zinc oxide [C01G 9/02](#))
- 19/36 . . in blast or reverberatory furnaces
- 19/38 . . in rotary furnaces
- 21/00 Obtaining aluminium**
- 21/0007 . {Preliminary treatment of ores or scrap or any other metal source (Bayer processes [C01F](#))}
- 21/0015 . {by wet processes ([C22B 21/02](#), [C22B 21/04](#) and [C22B 21/06](#) take precedence)}
- 21/0023 . . {from waste materials}
- 21/003 . . . {from spent catalysts}
- 21/0038 . {by other processes ([electrolysis C25C](#); [C22B 21/02](#) and [C22B 21/04](#) take precedence)}
- 21/0046 . . {from aluminium halides}
- 21/0053 . . {from other aluminium compounds}
- 21/0061 . . . {using metals, e.g. Hg or Mn}
- 21/0069 . . {from scrap, skimmings or any secondary source aluminium, e.g. recovery of alloy constituents ([C22B 21/0046](#), [C22B 21/0053](#) and [C22B 21/0092](#) take precedence)}
- 21/0076 . . . {from spent catalysts}
- 21/0084 . {melting and handling molten aluminium ([C22B 21/02](#), [C22B 21/04](#) and [C22B 21/06](#) take precedence)}
- 21/0092 . . {Remelting scrap, skimmings or any secondary source aluminium}
- 21/02 . with reducing {([C22B 21/04](#) takes precedence)}
- 21/04 . with alkali metals {earth alkali metals included}
- 21/06 . refining {(electrolytic refining [C25C](#); [C22B 21/0046](#), [C22B 21/0061](#) take precedence)}
- 21/062 . . {using salt or fluxing agents ([C22B 21/064](#), [C22B 21/066](#), and [C22B 21/068](#) take precedence)}
- 21/064 . . {using inert or reactive gases ([C22B 21/066](#) and [C22B 21/068](#) take precedence)}
- 21/066 . . {Treatment of circulating aluminium, e.g. by filtration ([C22B 21/068](#) takes precedence)}
- 21/068 . . {handling in vacuum}
- 23/00 Obtaining nickel or cobalt**
- 23/005 . {Preliminary treatment of ores, e.g. by roasting or by the Krupp-Renn process}
- 23/02 . by dry processes
- 23/021 . . {by reduction in solid state, e.g. by segregation processes}
- 23/023 . . {with formation of ferro-nickel or ferro-cobalt}
- 23/025 . . {with formation of a matte or by matte refining or converting into nickel or cobalt, e.g. by the Oxford process ([leaching of mattes C22B 23/04](#))}
- 23/026 . . {from spent catalysts}
- 23/028 . . {separation of nickel from cobalt}
- 23/04 . {by wet processes (recovery or separation of nickel or cobalt using organic agents [C22B 3/00](#))}
- 23/0407 . . {Leaching processes}
- 23/0415 . . . {with acids or salt solutions except ammonium salts solutions}
- 23/0423 . . . . {Halogenated acids or salts thereof}
- 23/043 . . . . {Sulfurated acids or salts thereof}
- 23/0438 . . . . {Nitric acids or salts thereof}
- 23/0446 . . . {with an ammoniacal liquor or with a hydroxide of an alkali or alkaline-earth metal}
- 23/0453 . . {Treatment or purification of solutions, e.g. obtained by leaching ([C22B 23/0407](#) takes precedence)}
- 23/0461 . . . {by chemical methods}
- 23/0469 . . . . {by chemical substitution, e.g. by cementation}
- 23/0476 . . {Separation of nickel from cobalt}
- 23/0484 . . . {in acidic type solutions}
- 23/0492 . . . {in ammoniacal type solutions}
- 23/06 . Refining
- 23/065 . . {carbonyl methods}
- 25/00 Obtaining tin**

- 25/02 . by dry processes
- 25/04 . {by wet processes}
- 25/06 . from scrap, especially tin scrap (by electrolytic procedure [C25C 1/14](#))
- 25/08 . Refining
- 26/00 Obtaining alkali, alkaline earth metals or magnesium**
- 26/10 . Obtaining alkali metals
- 26/12 . . Obtaining lithium
- 26/20 . Obtaining alkaline earth metals or magnesium
- 26/22 . . Obtaining magnesium
- 30/00 Obtaining antimony, arsenic or bismuth**
- 30/02 . Obtaining antimony
- 30/04 . Obtaining arsenic {(C22B 3/16, C22B 3/0005 and C22B 3/0098 take precedence)}
- 30/06 . Obtaining bismuth
- 34/00 Obtaining refractory metals**
- 34/10 . Obtaining titanium, zirconium or hafnium
- 34/12 . . Obtaining titanium {or titanium compounds from ores or scrap by metallurgical processing; preparation of titanium compounds from other titanium compounds see [C01G 23/00 - C01G 23/08](#)}
- 34/1204 . . . {preliminary treatment of ores or scrap to eliminate non- titanium constituents, e.g. iron, without attacking the titanium constituent}
- 34/1209 . . . . {by dry processes, e.g. with selective chlorination of iron or with formation of a titanium bearing slag}
- 34/1213 . . . . {by wet processes, e.g. using leaching methods or flotation techniques}
- 34/1218 . . . {obtaining titanium or titanium compounds from ores or scrap by dry processes}
- 34/1222 . . . . {using a halogen containing agent}
- 34/1227 . . . . {using an oxygen containing agent}
- 34/1231 . . . . {treatment or purification of titanium containing products obtained by dry processes, e.g. condensation}
- 34/1236 . . . {obtaining titanium or titanium compounds from ores or scrap by wet processes, e.g. by leaching}
- 34/124 . . . . {using acidic solutions or liquors}
- 34/1245 . . . . . {containing a halogen ion as active agent}
- 34/125 . . . . . {containing a sulfur ion as active agent}
- 34/1254 . . . . {using basic solutions or liquors}
- 34/1259 . . . . {treatment or purification of titanium containing solutions or liquors or slurries ([C01G 23/001](#) takes precedence)}
- 34/1263 . . . {obtaining metallic titanium from titanium compounds, e.g. by reduction ([C22B 34/129](#) takes precedence)}
- 34/1268 . . . . {using alkali or alkaline-earth metals or amalgams}
- 34/1272 . . . . . {reduction of titanium halides, e.g. Kroll process}
- 34/1277 . . . . {using other metals, e.g. Al, Si, Mn}
- 34/1281 . . . . {using carbon containing agents, e.g. C, CO, carbides ([C22B 34/1286](#) takes precedence)}
- 34/1286 . . . . {using hydrogen containing agents, e.g. H<sub>2</sub>, CaH<sub>2</sub>, hydrocarbons}
- 34/129 . . . . {obtaining metallic titanium from titanium compounds by dissociation, e.g. thermic dissociation of titanium tetraiodide, or by electrolysis or with the use of an electric arc}
- 34/1295 . . . . {Refining, melting, remelting, working up of titanium}
- 34/14 . . Obtaining zirconium or hafnium {(treatment or purification of solutions by liquid-liquid extraction, by ion exchange or by adsorption [C22B 3/00](#), [C01G 25/003](#), [C01G 27/003](#))}
- 34/20 . Obtaining niobium, tantalum or vanadium
- 34/22 . . Obtaining vanadium
- 34/225 . . . {from spent catalysts}
- 34/24 . . Obtaining niobium or tantalum
- 34/30 . Obtaining chromium, molybdenum or tungsten
- 34/32 . . Obtaining chromium
- 34/325 . . . {from spent catalysts}
- 34/34 . . Obtaining molybdenum {(C22B 3/0005, C22B 3/0098 and C01G 39/003 take precedence; from catalyst or superalloy scrap : see also [C22B 7/00](#))}
- 34/345 . . . {from spent catalysts}
- 34/36 . . Obtaining tungsten
- 34/365 . . . {from spent catalysts}
- 35/00 Obtaining beryllium**
- 41/00 Obtaining germanium {(C22B 3/0005 and C22B 3/0098 takes precedence)}**
- 43/00 Obtaining mercury**
- 47/00 Obtaining manganese**
- 47/0009 . {from spent catalysts}
- 47/0018 . {Treating ocean floor nodules}
- 47/0027 . . {Preliminary treatment}
- 47/0036 . . {by dry processes, e.g. smelting}
- 47/0045 . . {by wet processes}
- 47/0054 . . . {leaching processes}
- 47/0063 . . . . {with acids or salt solutions ([C22B 47/0072](#) takes precedence)}
- 47/0072 . . . . {with an ammoniacal liquor or with a hydroxide of an alkali or alkaline-earth metal}
- 47/0081 . . . {Treatment or purification of solutions, e.g. obtained by leaching ([C22B 47/0054](#) takes precedence)}
- 47/009 . . {refining, e.g. separation of metals obtained by the above methods}
- 58/00 Obtaining gallium or indium {(treatment or purification of solutions by liquid-liquid extraction, by ion exchange or by adsorption [C22B 3/0004](#))}**
- 59/00 Obtaining rare earth metals**
- 60/00 Obtaining metals of atomic number 87 or higher, i.e. radioactive metals**
- 60/02 . Obtaining thorium, uranium, or other actinides
- 60/0204 . . {obtaining uranium}
- 60/0208 . . . {preliminary treatment of ores or scrap}
- 60/0213 . . . {by dry processes}
- 60/0217 . . . {by wet processes}
- 60/0221 . . . . {by leaching}
- 60/0226 . . . . . {using acidic solutions or liquors}
- 60/023 . . . . . {halogenated ion as active agent}

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- 60/0234 . . . . . {sulfurated ion as active agent}
- 60/0239 . . . . . {nitric acid containing ion as active agent}
- 60/0243 . . . . . {phosphorated ion as active agent}
- 60/0247 . . . . . {using basic solutions or liquors}
- 60/0252 . . . . . {treatment or purification of solutions or of liquors or of slurries ([C22B 60/0221](#) takes precedence)}
- 60/0256 . . . . . {using biological agents, e.g. microorganisms or algae}
- 60/026 . . . . . {liquid-liquid extraction with or without dissolution in organic solvents}
- 60/0265 . . . . . {extraction by solid resins}
- 60/0269 . . . . . {Extraction by activated carbon containing adsorbents}
- 60/0273 . . . . . {Extraction by titanium containing adsorbents, e.g. by hydrous titanium oxide ([C22B 60/0269](#) takes precedence)}
- 60/0278 . . . . . {by chemical methods ([C22B 60/0256](#), [C22B 60/026](#), [C22B 60/0265](#) take precedence)}
- 60/0282 . . . . . {Solutions containing P ions, e.g. treatment of solutions resulting from the leaching of phosphate ores or recovery of uranium from wet-process phosphoric acid}
- 60/0286 . . . {refining, melting, remelting, working up uranium}
- 60/0291 . . {obtaining thorium}
- 60/0295 . . {obtaining other actinides except plutonium}
- 60/04 . . Obtaining plutonium
- 61/00** **Obtaining metals not elsewhere provided for in this subclass ([iron C21](#))**