

# CPC COOPERATIVE PATENT CLASSIFICATION

## 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.

### WARNING

The following IPC groups are not used in the CPC system. Subject matter covered by these groups is classified in the following CPC groups:

[C22B 3/26 - C22B 3/40](#) covered by [C22B 3/0005](#)

<b>1/00</b>	<b>Preliminary treatment of ores or scrap (furnaces, sintering apparatus F27B)</b>	3/0002	. . {Leaching with an ammoniacal liquor or with a hydroxide of an alkali or an alkaline earth metal}
1/005	. {Preliminary treatment of scrap ( <a href="#">C22B 1/02 - C22B 1/26</a> take precedence)}		<b>WARNING</b>
1/02	. Roasting processes ( <a href="#">C22B 1/16</a> takes precedence)		Group <a href="#">C22B 3/0002</a> 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 <a href="#">C22B</a>
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	3/0004	. {Treatment or purification of solutions, e.g. obtained by leaching ( <a href="#">C22B 3/04</a> takes precedence)}
1/14	. Agglomerating; Briquetting; Binding; Granulating		<b>WARNING</b>
1/16	. . Sintering; Agglomerating		Not used, see subgroups
1/18	. . . in sinter pots		
1/20	. . . in sintering machines with movable grates		
1/205	. . . . {regulation of the sintering process}	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</a> takes precedence)}
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}	3/0006	. . . {using acyclic or carbocyclic compounds}
1/2406	. . . {pelletizing}	3/0008	. . . . {using acyclic or carbocyclic compounds of a single type}
1/2413	. . . {enduration of pellets}		
1/242	. . . with binders	3/0009	. . . . . {using alcohols or phenols}
1/243	. . . . inorganic	3/001	. . . . . {using amines ( <a href="#">amino acids C22B 3/0024</a> )}
1/244	. . . . organic		
1/245	. . . . . with carbonaceous material for the production of coked agglomerates	3/0012	. . . . . {using aliphatic amines}
		3/0013	. . . . . {using aromatic amines}
1/248	. . . of metal scrap or alloys	3/0014	. . . . . {using amino-alcohols}
1/26	. Cooling of roasted, sintered, or agglomerated ores	3/0016	. . . . . {using quaternary ammonium}
		3/0017	. . . . . {using oximes}
<b>3/00</b>	<b>Extraction of metal compounds from ores or concentrates by wet processes</b>	3/0018	. . . . . {using ethers or epoxides}
	<b>NOTE</b>	3/002	. . . . . {using crown ethers}
	This group covers methods directed to the extraction of three or more metals.	3/0021	. . . . . {using ketones or aldehydes}
	For the recovery of one or two metals, see the other groups of this subclass concerning these metals	3/0022	. . . . . {using organic acids ( <a href="#">C22B 3/0031</a> , <a href="#">C22B 3/0035</a> , <a href="#">C22B 3/004</a> take precedence)}
		3/0024	. . . . . {using acids of the carboxylic type or derivatives thereof, e.g. amino acids, nitriles, amides, hydroxamic acids}
3/0001	. {Leaching of ores not used, see subgroups}	3/0025	. . . . . {using oxalic acids}
		3/0027	. . . . . {using naphthenic acids}

- 3/0028 . . . . . {using ramified chain carboxylic acids or derivatives thereof, e.g. "versatic" acids}
- 3/0029 . . . . . {using cyanic acids or derivatives thereof ([C22B 3/0031](#), [C22B 3/0035](#), [C22B 3/004](#) take precedence)}
- 3/0031 . . . . . {using organic compounds containing sulfur atom(s), e.g. sulfonium ([C22B 3/004](#) takes precedence)}
- 3/0032 . . . . . {using mixtures of acyclic or carbocyclic compounds of different types ([C22B 3/0035](#), [C22B 3/004](#) take precedence)}
- 3/0033 . . . . . {using organic acids added to oximes}
- 3/0035 . . . {using heterocyclic compounds ([C22B 3/0018](#), [C22B 3/002](#) and [C22B 3/0031](#) take precedence)}
- 3/0036 . . . . . {using heterocyclic compounds of a single type}
- 3/0037 . . . . . {using quinoline}
- 3/0039 . . . . . {using a mixture of organic agents wherein one agent at least is a heterocyclic compound ([C22B 3/004](#) takes precedence)}
- 3/004 . . . {using organo-metallic compounds or organo compounds of boron, silicon, phosphorus, selenium or tellurium}
- 3/0041 . . . . . {using organo-metallic compounds of a single type}
- 3/0043 . . . . . {using phosphorus-based acid derivatives}
- 3/0044 . . . . . {of a single type}
- 3/0045 . . . . . {Acyclic compounds}
- 3/0047 . . . . . {of the phosphine or phosphane (PH<sub>3</sub>) type}
- 3/0048 . . . . . {Primary (RPH<sub>2</sub>) compounds}
- 3/005 . . . . . {Secondary (R<sub>2</sub>PH) compounds}
- 3/0051 . . . . . {Tertiary (R<sub>3</sub>PH) 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}
- 3/0054 . . . . . {of the phosphorane (PH<sub>5</sub>) type}
- 3/0055 . . . . . {of the phosphonium (PR<sub>4</sub>) type}
- 3/0056 . . . . . {Mononuclear oxyacids of trivalent phosphorus or their esters(-ite)}
- 3/0058 . . . . . {Phosphenous (HOPO) type}
- 3/0059 . . . . . {Phosphinous (H<sub>2</sub>POH) type}
- 3/006 . . . . . {Phosphonous (H<sub>2</sub>P(OH)<sub>2</sub>) type}
- 3/0062 . . . . . {Phosphorous (P(OH)<sub>3</sub>) type}
- 3/0063 . . . . . {Mononuclear oxyacids of pentavalent phosphorus or their esters(-ate)}
- 3/0064 . . . . . {Phosphenic (HOP(O)<sub>2</sub>) or metaphosphoric type}
- 3/0066 . . . . . {Phosphinic (H<sub>2</sub>P(O)(OH)) type}
- 3/0067 . . . . . {Phosphonic (H<sub>2</sub>P(O)(OH)<sub>2</sub>) type}
- 3/0068 . . . . . {Phosphoric ((O)P(OH)<sub>3</sub>) type}
- 3/007 . . . . . {Thiophosphoric acids or their esters}
- 3/0071 . . . . . {Dinuclear or polynuclear oxyacids and their derivatives}
- 3/0072 . . . . . {Compounds with phosphorus-nitrogen (P=N) double bonds}
- 3/0074 . . . . . {compounds with (P-P) bonds}
- 3/0075 . . . . . {compounds with (P-Xn-P) bonds (n, 0, X: other than P), e.g. pyro- or di-}
- 3/0077 . . . . . {Cyclic compounds, e.g. aryl-, phenyl-, benzyl-compounds}
- 3/0078 . . . . . {using a mixture of phosphorus-based acid derivatives of different types}
- 3/0079 . . . . . {of the acyclic type}
- 3/0081 . . . . . {two or more of the phosphine type}
- 3/0082 . . . . . {two or more of the phosphine oxides or sulfides type}
- 3/0083 . . . . . {two or more of the phosphorane type}
- 3/0085 . . . . . {two or more of the phosphonium type}
- 3/0086 . . . . . {two or more of the mononuclear oxyacids of trivalent phosphorus or their esters}
- 3/0087 . . . . . {two or more mononuclear oxyacids of quinquivalent phosphorus or their esters}
- 3/0089 . . . . . {two or more thiophosphoric acids or their esters}
- 3/009 . . . . . {two or more dinuclear or polynuclear oxyacids or their derivatives}
- 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 micro-organisms 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 electroslag 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 . . Electroslag remelting {([electroslag 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}
- 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. micro organisms 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}

## C22B

- 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](#))**