**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**

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:

<table>
<thead>
<tr>
<th>IPC Group</th>
<th>CPC Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>C22B 3/26 - C22B 3/40</td>
<td>C22B 3/0005</td>
</tr>
<tr>
<td>C22B 9/187</td>
<td>covered by</td>
</tr>
<tr>
<td>C22B 9/193</td>
<td>covered by</td>
</tr>
<tr>
<td>C22B 9/21</td>
<td>covered by</td>
</tr>
<tr>
<td>C22B 15/02-C22B 15/14</td>
<td>covered by</td>
</tr>
</tbody>
</table>

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.

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<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>1/00</td>
<td>Preliminary treatment of ores or scrap (furnaces, sintering apparatus F27B)</td>
</tr>
<tr>
<td>1/005</td>
<td>(Preliminary treatment of scrap)</td>
</tr>
<tr>
<td>1/02</td>
<td>Roasting processes (C22B 1/16 takes precedence)</td>
</tr>
<tr>
<td>1/04</td>
<td>Blast roasting</td>
</tr>
<tr>
<td>1/06</td>
<td>Sulfating roasting</td>
</tr>
<tr>
<td>1/08</td>
<td>Chloridising roasting</td>
</tr>
<tr>
<td>1/10</td>
<td>in fluidised form</td>
</tr>
<tr>
<td>1/11</td>
<td>Removing sulfur, phosphorus or arsenic other than by roasting</td>
</tr>
<tr>
<td>1/14</td>
<td>Agglomerating; Briquetting; Binding; Granulating</td>
</tr>
<tr>
<td>1/16</td>
<td>Sintering; Agglomerating</td>
</tr>
<tr>
<td>1/18</td>
<td>in sinter pots</td>
</tr>
<tr>
<td>1/20</td>
<td>in sintering machines with movable grates</td>
</tr>
<tr>
<td>1/205</td>
<td>Regulation of the sintering process</td>
</tr>
<tr>
<td>1/212</td>
<td>in tunnel furnaces</td>
</tr>
<tr>
<td>1/214</td>
<td>in shaft furnaces</td>
</tr>
<tr>
<td>1/216</td>
<td>in rotary furnaces</td>
</tr>
<tr>
<td>1/22</td>
<td>in other sintering apparatus</td>
</tr>
<tr>
<td>1/24</td>
<td>Binding; Briquetting; (Granulating)</td>
</tr>
<tr>
<td>1/2406</td>
<td>Pelletizing</td>
</tr>
<tr>
<td>1/2413</td>
<td>Enduration of pellets</td>
</tr>
<tr>
<td>1/242</td>
<td>with binders</td>
</tr>
<tr>
<td>1/243</td>
<td>inorganic</td>
</tr>
<tr>
<td>1/244</td>
<td>organic</td>
</tr>
</tbody>
</table>

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**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.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/0001</td>
<td>Leaching of ores not used. see subgroups</td>
</tr>
<tr>
<td>3/0002</td>
<td>Leaching with an ammoniacal liquor or with a hydroxide of an alkali or an alkaline earth metal</td>
</tr>
</tbody>
</table>

**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.
WARNING
Not used, see subgroups

3/0004 . . . . . [Treatment or purification of solutions, e.g. obtained by leaching (C22B 3/004 takes precedence)]

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 (C22B 3/205 takes precedence)]

3/0006 . . . . . [using acyclic or carbocyclic compounds]

3/0008 . . . . . [using acyclic or carbocyclic compounds of a single type]

3/0009 . . . . . [using alcohols or phenols]

3/001 . . . . . [using amines (amino acids C22B 3/0024)]

3/0012 . . . . . [using aliphatic amines]

3/0013 . . . . . [using aromatic amines]

3/0014 . . . . . [using amino-alcohols]

3/0016 . . . . . [using quaternary ammonium]

3/0017 . . . . . [using oximes]

3/0018 . . . . . [using ethers or epoxides]

3/002 . . . . . [using crown ethers]

3/0021 . . . . . [using ketones or aldehydes]

3/0022 . . . . . [using organic acids (C22B 3/0031, C22B 3/0035, C22B 3/004 take precedence)]

3/0024 . . . . . [using acids of the carboxylic type or derivatives thereof, e.g. amino acids, nitriles, amides, hydroxamic acids]

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 . . . . . [of a single type]

3/0044 . . . . . [of a single type]

3/0045 . . . . . [Acyclic compounds]

3/0047 . . . . . [of the phosphine or phosphane (PH$_3$) type]

3/0048 . . . . . [Primary (RPH$_2$) compounds]

3/005 . . . . . [Secondary (R$_2$PH) compounds]

3/0051 . . . . . [Tertiary (R$_3$PH) compounds]

3/0052 . . . . . [Chalcogenides of phosphine, e.g. (R,P=Z) type with Z = O, S, Se or Te; Oxides, Thio-oxides of phosphine]

3/0054 . . . . . [of the phosphorane (PH$_3$) type]

3/0055 . . . . . [of the phosphonium (PR$_4$) type]

3/0056 . . . . . [Mononuclear oxyacids of tervalent phosphorus or their esters(-ite)]

3/0058 . . . . . [Phosphenoxy (H$_2$POH) type]

3/0059 . . . . . [Phosphinous (H$_2$POH)$_2$ type]

3/006 . . . . . [Phosphonic (H$_3$PO$_2$) type]

3/0062 . . . . . [Phosphorous (H$_3$PO$_3$) type]

3/0063 . . . . . [Mononuclear oxyacids of pentavalent phosphorus or their esters(-ate)]

3/0064 . . . . . [Phosphenic (H$_3$PO$_4$) or metaphosphoric type]

3/0066 . . . . . [Phosphinic (H$_3$PO$_4$) type]

3/0067 . . . . . [Phosphonic (H$_3$PO$_4$) type]

3/0068 . . . . . [Phosphoric ((O)P(OH)$_3$) 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 phosphate type]

3/0082 . . . . . [two or more of the phosphate 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 tervalent phosphorus or their esters]

3/0087 . . . . . [two or more mononuclear oxyacids of quinquevalent 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]
WARNING

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

3/22 . . . 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 3/0008 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 matts} 

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 


5/20 . . 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)
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 9/00, C22B 9/06, C22B 9/05, C22B 9/22 take precedence)
- 9/023  By filtering (filtration of aluminum 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 filtration
- 9/10  with refining or freezing 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 freezing 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 B22B 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 H01L, 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 gauges
- 11/04  by wet processes (C22B 3/16 takes precedence; treatment or purification of solutions by liquid-liquid extraction C22B 3/005, by ion exchange or by adsorption C22B 3/00, C01G; C22B 3/16, C22B 3/005)
- 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
- 15/002  (Preliminary treatment)
- 15/004  without modification of the copper constituent
- 15/006  by dry processes
- 15/008  by wet processes (by flotation B03D)
- 15/01  with modification of the copper constituent
- 15/013  by roasting
- 15/015  Oxidizing roasting
- 15/017  Sulfating or sulfiding roasting
- 15/019  Chloridizing roasting (regeneration C22B 15/0023)
- 15/021  by reducing in gaseous or solid state (slag reduction C22B 15/0054)
- 15/023  Segregation
- 15/026  Pyrometallurgy
- 15/028  Smelting or converting
- 15/003  Bath smelting or converting
- 15/001  in shaft furnaces, e.g., blast furnaces
- 15/002  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, spess, or dross treating
- 15/0056  Scrap treating
C22B

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 3/004))
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 C01E)]
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 (take 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
Obtaining refractory metals

Obtaining refractory metals

Obtaining refractory metals

Obtaining refractory metals

Obtaining refractory metals

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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)