

ECLA EUROPEAN CLASSIFICATION

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

[N: **WARNING**
[C0504]

- The following IPC groups are not used in the internal ECLA classification system. Subject matter covered by these groups is classified in the following ECLA groups:

[C22B3/26](#) to [C22B3/40](#) covered by [C22B3/00D2](#)

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Note

In this subclass, groups for obtaining metals include obtaining the metals by non-metallurgical processes, and obtaining metal compounds by metallurgical processes, [N: as far as specifically indicated in the relevant groups]. Thus, for example, group [C22B11/00](#) covers the production of silver by reduction of ammoniacal silver oxide in solution, and group [C22B17/00](#) 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.

C22B1/00 Preliminary treatment of ores or scrap (furnaces, sintering apparatus [F27B](#))

- C22B1/00D . [N: Preliminary treatment of scrap ([C22B1/02](#) up to [C22B1/26](#) take precedence)]
- C22B1/02 . Roasting processes ([C22B1/16](#) takes precedence)
- C22B1/04 . . Blast roasting
- C22B1/06 . . Sulfating roasting
- C22B1/08 . . Chloridising roasting
- C22B1/10 . . in fluidised form
- C22B1/11 . Removing sulfur, phosphorus or arsenic other than by roasting
- C22B1/14 . Agglomerating; Briquetting; Binding; Granulating
- C22B1/16 . . Sintering; Agglomerating
- C22B1/18 . . . in sinter pots
- C22B1/20 . . . in sintering machines with movable grates
- C22B1/20B [N: regulation of the sintering process]
- C22B1/212 . . . in tunnel furnaces
- C22B1/214 . . . in shaft furnaces
- C22B1/216 . . . in rotary furnaces
- C22B1/22 . . . in other sintering apparatus
- C22B1/24 . . Binding; Briquetting; [N: Granulating]
- C22B1/24B . . . [N: pelletizing]

- C22B1/24D . . . [N: endurance of pellets]
- C22B1/242 . . . with binders
- C22B1/243 inorganic
- C22B1/244 organic
- C22B1/245 with carbonaceous material for the production of coked agglomerates
- C22B1/248 . . . of metal scrap or alloys

- C22B1/26 . Cooling of roasted, sintered, or agglomerated ores

C22B3/00 Extraction of metal compounds from ores or concentrates by wet processes

[N: **Notes**

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 [N0806]
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- C22B3/00A . [N: Leaching of ores] [N: not used, see subgroups]
- C22B3/00A2 . . [N: Leaching with an ammoniacal liquor or with a hydroxide of an alkali or an alkaline earth metal]

- [N: **WARNING**
[N0504] Group [C22B3/00A2](#) 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](#)
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- C22B3/00D . [N: Treatment or purification of solutions, e.g. obtained by leaching ([C22B3/04](#) takes precedence)] [N: WARNING: Not used, see subgroups]
- C22B3/00D2 . . [N: by liquid-liquid extraction using organic compounds, e.g. acyclic or carbocyclic compounds, heterocyclic compounds, organo- metallic compounds, alcohols, ethers, or the like ([C22B3/20B](#) takes precedence)]
- C22B3/00D2B . . . [N: using acyclic or carbocyclic compounds]
- C22B3/00D2B2 [N: using acyclic or carbocyclic compounds of a single type]
- C22B3/00D2B2A [N: using alcohols or phenols]
- C22B3/00D2B2C [N: using amines (amino acids [C22B3/00D2B2G2](#))]
- C22B3/00D2B2C2 [N: using aliphatic amines]
- C22B3/00D2B2C4 [N: using aromatic amines]
- C22B3/00D2B2C6 [N: using amino-alcohols]
- C22B3/00D2B2C8 [N: using quaternary ammonium]
- C22B3/00D2B2D [N: using oximes]
- C22B3/00D2B2E [N: using ethers or epoxides]
- C22B3/00D2B2E2 [N: using crown ethers]
- C22B3/00D2B2F [N: using ketones or aldehydes]
- C22B3/00D2B2G [N: using organic acids ([C22B3/00D2B2K](#) or [C22B3/00D2H](#) or [C22B3/00D2M](#) takes precedence)]
- C22B3/00D2B2G2 [N: using acids of the carboxylic type or derivatives thereof, e.g. amino acids, nitriles, amides, hydroxamic acids]

C22B3/00D2B2G2B	. . . . .	{7 dots} [N: using oxalic acids]
C22B3/00D2B2G2C	. . . . .	{7 dots} [N: using naphthenic acids]
C22B3/00D2B2G2D	. . . . .	{7 dots} [N: using ramified chain carboxylic acids or derivatives thereof, e.g. "versatic" acids]
C22B3/00D2B2H	. . . . .	[N: using cyanic acids or derivatives thereof (C22B3/00D2B2K or C22B3/00D2H or C22B3/00D2M takes precedence)]
C22B3/00D2B2K	. . . . .	[N: using organic compounds containing sulfur atom(s), e.g. sulfonium (C22B3/00D2M takes precedence)]
C22B3/00D2B4	. . . . .	[N: using mixtures of acyclic or carbocyclic compounds of different types (C22B3/00D2H or C22B3/00D2M takes precedence)]
C22B3/00D2B4B	. . . . .	[N: using organic acids added to oximes]
C22B3/00D2H	. . . . .	[N: using heterocyclic compounds (C22B3/00D2B2E , C22B3/00D2B2E2 and C22B3/00D2B2K take precedence)]
C22B3/00D2H2	. . . . .	[N: using heterocyclic compounds of a single type]
C22B3/00D2H2B	. . . . .	[N: using quinoline]
C22B3/00D2H4	. . . . .	[N: using a mixture of organic agents wherein one agent at least is a heterocyclic compound (C22B3/00D2M takes precedence)]
C22B3/00D2M	. . . . .	[N: using organo-metallic compounds or organo compounds of boron, silicon, phosphorus, selenium or tellurim]
C22B3/00D2M2	. . . . .	[N: using organo-metallic compounds of a single type]
C22B3/00D2M2P	. . . . .	[N: using phosphorus-based acid derivatives]
C22B3/00D2M2P2	. . . . .	[N: of a single type]
C22B3/00D2M2P2B	. . . . .	{7 dots} [N: Acyclic compounds]
C22B3/00D2M2P2B2	. . . . .	{8 dots} [N: of the phosphine or phosphane (PH ₃) type]
C22B3/00D2M2P2B2P	. . . . .	{9 dots} [N: Primary (RPH ₂) compounds]
C22B3/00D2M2P2B2S	. . . . .	{9 dots} [N: Secondary (R ₂ PH) compounds]
C22B3/00D2M2P2B2T	. . . . .	{9 dots} [N: Tertiary (R ₃ PH) compounds]
C22B3/00D2M2P2B4	. . . . .	{8 dots} [N: Chalcogenides of phosphine, e.g. (R ₃ P=X) type with X = O, S, Se or Te; Oxides, Thio-oxides of phosphine]
C22B3/00D2M2P2B5	. . . . .	{8 dots} [N: of the phosphorane (PH ₅) type]
C22B3/00D2M2P2B6	. . . . .	{8 dots} [N: of the phosphonium (PR ₄) type]
C22B3/00D2M2P2B8	. . . . .	{8 dots} [N: Mononuclear oxyacids of trivalent phosphorus or their esters(-ite)]
C22B3/00D2M2P2B8E	. . . . .	{9 dots} [N: Phosphenous (HOPO) type]
C22B3/00D2M2P2B8I	. . . . .	{9 dots} [N: Phosphinous (H ₂ POH) type]
C22B3/00D2M2P2B8Q	. . . . .	{9 dots} [N: Phosphonous (H ₂ P(OH) ₂) type]
C22B3/00D2M2P2B8R	. . . . .	{9 dots} [N: Phosphorous (P(OH) ₃) type]
C22B3/00D2M2P2B12	. . . . .	{8 dots} [N: Mononuclear oxyacids of pentavalent phosphorus or their esters(-ate)]
C22B3/00D2M2P2B12E	. . . . .	{9 dots} [N: Phosphenic (HOP(O) ₂) or metaphosphoric type]
C22B3/00D2M2P2B12I	. . . . .	{9 dots} [N: Phosphinic (H ₂ P(O)(OH)) type]
C22B3/00D2M2P2B12Q	. . . . .	{9 dots} [N: Phosphonic (H ₂ P(O)(OH) ₂) type]
C22B3/00D2M2P2B12R	. . . . .	{9 dots} [N: Phosphoric ((O)P(OH) ₃) type]
C22B3/00D2M2P2B14	. . . . .	{8 dots} [N: Thiophosphoric acids or their esters]
C22B3/00D2M2P2B20	. . . . .	{8 dots} [N: Dinuclear or polynuclear oxyacids and their

- ivatives]
- C22B3/00D2M2P2B2QN {9 dots} [N: Compounds with phosphorus-nitrogen (P=N) double bonds]
- C22B3/00D2M2P2B2QP {9 dots} [N: compounds with (P-P) bonds]
- C22B3/00D2M2P2B2QX {9 dots} [N: compounds with (P-Xn-P) bonds (n, 0, X: other than P), e.g. pyro- or di-]
- C22B3/00D2M2P2D {7 dots} [N: Cyclic compounds e.g. aryl-, phenyl-, benzyl-compounds]
- C22B3/00D2M2P4 [N: using a mixture of phosphorus-based acid derivatives of different types]
- C22B3/00D2M2P4B {7 dots} [N: of the acyclic type]
- C22B3/00D2M2P4B2 {8 dots} [N: two or more of the phosphine type]
- C22B3/00D2M2P4B4 {8 dots} [N: two or more of the phosphine oxides or sulfides type]
- C22B3/00D2M2P4B5 {8 dots} [N: two or more of the phosphorane type]
- C22B3/00D2M2P4B6 {8 dots} [N: two or more of the phosphonium type]
- C22B3/00D2M2P4B8 {8 dots} [N: two or more of the mononuclear oxyacids of tervalent phosphorus or their esters]
- C22B3/00D2M2P4B12 {8 dots} [N: two or more mononuclear oxyacids of quinquevalent phosphorus or their esters]
- C22B3/00D2M2P4B14 {8 dots} [N: two or more thiophosphoric acids or their esters]
- C22B3/00D2M2P4B20 {8 dots} [N: two or more dinuclear or polynuclear oxyacids or their derivatives]
- C22B3/00D2M2P4B30 {8 dots} [N: combinations of the above]
- C22B3/00D2M2P4D {7 dots} [N: comprising cyclic compounds only]
- C22B3/00D2M2P4E {7 dots} [N: comprising cyclic and acyclic compounds]
- C22B3/00D2M4 [N: using a mixture of organic agents wherein one agent at least is an organo-metallic compound]
- C22B3/00D2P [N: using a solution of normally solid organic compounds, e.g. dissolved polymers, sugars, or the like]
- C22B3/00D4 [N: by ion exchange extraction or by adsorption on solid substances, e.g. by extraction with solid resins ([C22B3/00D2P](#) takes precedence)] [C0504]

[N: **WARNING**

[N0504] Group [C22B3/00D4](#) 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](#)
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- C22B3/02 Apparatus therefor
- C22B3/04 by leaching ([C22B3/18](#) takes precedence) [N0504]
- C22B3/04E [N: Leaching using electrochemical processes] [N0504]
- C22B3/06 in inorganic acid solutions, [N: e.g. with acids generated in situ; in inorganic salt solutions other than ammonium salt solutions] [N0504]
- C22B3/06D [N: Nitric acids or salts thereof] [N0504]
- C22B3/08 Sulfuric acid, [N: other sulfurated acids or salts thereof] [N0504]
- C22B3/10 Hydrochloric acid, [N: other halogenated acids or salts thereof] [N0504]

- C22B3/12 . . . in inorganic alkaline solutions [N0504]
- C22B3/14 . . . containing ammonia or ammonium salts [N0504]
- [N: **WARNING**
[N0504] Group [C22B3/14](#) was introduced on May 1st, 2005. This group covers the subject-matter of group [C22B3/00A2](#) which is no longer used for classification of new documents
]
- C22B3/16 . . . in organic solutions [N0504]
- C22B3/16B [N: Leaching with acyclic or carbocyclic agents] [N0504]
- C22B3/16B2 [N: Leaching with acyclic or carbocyclic agents of a single type] [N0504]
- C22B3/16B2C [N: with amines (amino acids [C22B3/16B2G](#))] [N0504]
- C22B3/16B2D [N: with oximes] [N0504]
- C22B3/16B2F [N: with ketones or aldehydes] [N0504]
- C22B3/16B2G [N: with organic acids] [N0504]
- C22B3/16B4 [N: Leaching with acyclic or carbocyclic agents of different types in admixture, e.g. with organic acids added to oximes] [N0504]
- C22B3/16H [N: Leaching with heterocyclic compounds] [N0504]
- C22B3/16H4 [N: Leaching with a mixture of organic agents wherein one agent at least is a heterocyclic compounds ([C22B3/16M](#) takes precedence)] [N0504]
- C22B3/16M [N: Leaching with organo-metallic compounds] [N0504]
- C22B3/16M4 [N: Leaching with a mixture of organic agents wherein at least one agent is an organo-metallic compound] [N0504]
- C22B3/18 . . . with the aid of micro-organisms or enzymes, e.g. bacteria or algae [N9702]
- C22B3/20 . . . Treatment or purification of solutions, e.g. obtained by leaching ([C22B3/18](#) takes precedence) [N0504]
- C22B3/20B . . . [N: using adducts or inclusion complexes] [N0504]
- C22B3/22 . . . by physical processes, e.g. by filtration, by magnetic means, [N: by thermal decomposition] ([C22B3/26](#) takes precedence) [N0504]
- C22B3/24 by adsorption on solid substances, e.g. by extraction with solid resins [N0504]
- [N: **WARNING**
[N0504] Group [C22B3/24](#) was introduced on May 1st, 2005. This group covers the subject-matter of group [C22B3/00D4](#) which is no longer used for classification of new documents
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- C22B3/42 . . . by ion-exchange extraction [N0504]
- [N: **WARNING**
[N0504] Group [C22B3/42](#) was introduced on May 1st, 2005. This group covers the subject-matter of group [C22B3/00D4](#) which is no longer used for classification of new documents
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- C22B3/44 . . . by chemical processes ([C22B3/00D2](#) to [C22B3/20D2P](#) take precedence)[N0504]
- C22B3/46 by substitution, e.g. by cementation [N0504]
- C22B4/00** **Electrothermal treatment of ores or metallurgical products for obtaining metals or alloys** ([obtaining iron or steel](#) [C21B](#), [C21C](#))

- C22B4/00B . [N: using plasma jets (smelting, remelting, refining of metals using a plasma as heat source [C22B9/22](#); Generating or handling plasma in general [H05H1/00](#); Gas-filled discharge tubes for processing materials in general [H01J37/32](#))]
- C22B4/02 . Light metals [N: ([C22B4/00B](#) takes precedence)]
- C22B4/04 . Heavy metals [N: ([C22B4/00B](#) takes precedence)]
- C22B4/06 . Alloys [N: ([C22B4/00B](#) takes precedence)]
- C22B4/08 . Apparatus ([N: [C22B4/00B](#) takes precedence;] electric heating elements [H05B](#))

C22B5/00 General methods of reducing to metals

- C22B5/02 . Dry methods [N: smelting of sulfides or formation of mattes]
- C22B5/04 . . by aluminium, other metals or silicon
- C22B5/06 . . by carbides or the like
- C22B5/08 . . by sulfides; Roasting reaction methods
- C22B5/10 . . by solid carbonaceous reducing agents
- C22B5/12 . . by gases
- C22B5/14 . . . fluidised material
- C22B5/16 . . with volatilisation or condensation of the metal being produced
- C22B5/18 . . Reducing step-by-step
- C22B5/20 . . from metal carbonyls

C22B7/00 Working up raw materials other than ores, e.g. scrap, to produce non-ferrous metals and compounds thereof; [N: Methods of a general interest or applied to the winning of more than two metals (briquetting of scrap [C22B1/248](#); preliminary treatment of scrap [C22B1/00D](#))]

- C22B7/00B . [N: Dry processes]
- C22B7/00B2 . . [N: by treating with halogens, sulfur or compounds thereof; by carburising, by treating with hydrogen (hydriding)]
- C22B7/00B4 . . [N: only remelting, e.g. of chips, borings, turnings; apparatus used therefor]
- C22B7/00B6 . . [N: 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)]
- C22B7/00C . [N: Separation by a physical processing technique only, e.g. by mechanical breaking]
- C22B7/00D . [N: Wet processes]
- C22B7/00D1 . . [N: by acid leaching]
- C22B7/00D2 . . [N: by an alkaline or ammoniacal leaching]
- C22B7/00R . [N: General processes for recovering metals or metallic compounds from spent catalysts (for recovering specific metals [C22B11/00](#) to [C22B61/00](#))]
- C22B7/02 . Working-up flue dust

- C22B7/04 . Working-up slag

- C22B9/00 General processes of refining or remelting of metals; Apparatus for electroslag or arc remelting of metals**

- C22B9/00I . [N: by induction]
- C22B9/00P . [N: with use of an inert protective material including the use of an inert gas]
- C22B9/02 . Refining by liquating, filtering, centrifuging, distilling, or supersonic wave action [N: including acoustic waves; ([C22B9/00I](#), [C22B9/00P](#), [C22B9/05](#), [C22B9/22](#) take precedence)]
- C22B9/02F . . [N: By filtering (filtration of aluminium [C22B21/06F](#))]
- C22B9/02S . . [N: by acoustic waves, e.g. supersonic waves]

- C22B9/04 . Refining by applying a vacuum

- C22B9/05 . Refining by treating with gases, e.g. gas flushing [N: also refining by means of a material generating gas in situ]
- C22B9/05F . . [N: while the metal is circulating, e.g. combined with filtration]

- C22B9/10 . with refining or fluxing agents; use of materials therefor, [N: e.g. slagging or scorifying agents] ([C22B9/18](#) takes precedence) [N: ([C22B9/00P](#) takes precedence)]
- C22B9/10M . . [N: Methods of introduction of solid or liquid refining or fluxing agents]
- C22B9/10S . . [N: the refining being obtained by intimately mixing the molten metal with a molten salt or slag]

- C22B9/14 . Refining in the solid state

- C22B9/16 . Remelting metals (liquating [C22B9/02](#))
- C22B9/18 . . Electroslag remelting [N: (electroslag casting [B22D23/10](#))]
- C22B9/20 . . Arc remelting
- C22B9/22 . . With heating by wave energy or particle radiation([N: by acoustic waves [C22B9/02S](#)])
- C22B9/22E . . . [N: by electromagnetic waves, e.g. by gas discharge lamps]
- C22B9/22E2 [N: by laser beams (working by laser beam [B23K26/00](#))]
- C22B9/22E4 [N: by microwaves]
- C22B9/22P . . . [N: by electric discharge, e.g. plasma ([C22B9/20](#) takes precedence; apparatus therefor [H01J](#), [H05B](#), [H05H](#); chemical reactions with metals in a plasma [C22B4/00B](#))]
- C22B9/22R . . . [N: by particle radiation, e.g. electron beams]

- C22B11/00 Obtaining noble metals**

- C22B11/02 . by dry processes
- C22B11/02R . . [N: Recovery of noble metals from waste materials]
- C22B11/02R4 . . . [N: from pyrometallurgical residues, e.g. from ashes, dross, flue dust, mud,

- skim, slag, sludge]
- C22B11/02R8 . . . [N: from manufactured products, e.g. from printed circuit boards, from photographic films, paper, or baths]
- C22B11/02R12 . . . [N: from spent catalysts]
- C22B11/02R12G [N: using solid sorbents, e.g. getters or catchment gauzes]
- C22B11/04 . [N: IPC 4] by wet processes [N: ([C22B3/16](#) takes precedence; treatment or purification of solutions by liquid-liquid extraction [C22B3/00D2](#), by ion exchange or by adsorption [C22B3/00](#), [C01G](#); [C22B3/16](#), [C22B3/00D2](#))]
- C22B11/04R . . [N: Recovery of noble metals from waste materials]
- C22B11/04R4 . . . [N: from pyrometallurgical residues, e.g. from ashes, dross, flue dust, mud, skim, slag, sludge]
- C22B11/04R8 . . . [N: from manufactured products, e.g. from printed circuit boards, from photographic films, paper or baths]
- C22B11/04R12 . . . [N: from spent catalysts]
- C22B11/06 . chloridising
- C22B11/08 . by cyaniding
- C22B11/10 . by amalgamating
- C22B11/12 . . Apparatus therefor

C22B13/00 **Obtaining lead**

- C22B13/02 . by dry processes
- C22B13/02R . . [N: Recovery from waste materials]
- C22B13/04 . [N: IPC 4] by wet processes
- C22B13/04R . . [N: Recovery from waste materials]
- C22B13/06 . Refining
- C22B13/08 . . Separating metals from lead by precipitating, e.g. Parkes process
- C22B13/10 . . Separating metals from lead by crystallising, e.g. by Pattison process

C22B15/00 **Obtaining copper**

- C22B15/00B . [N: Preliminary treatment]
- C22B15/00B2 . . [N: without modification of the copper constituent]
- C22B15/00B2B . . . [N: by dry processes]
- C22B15/00B2D . . . [N: by wet processes (by flotation [B03D](#))]
- C22B15/00B4 . . [N: with modification of the copper constituent]
- C22B15/00B4B . . . [N: by roasting]
- C22B15/00B4B2 [N: Oxidizing roasting]
- C22B15/00B4B4 [N: Sulfating or sulfiding roasting]
- C22B15/00B4B6 [N: Chloridizing roasting ([segregation](#) [C22B15/00B4D2](#))]

- C22B15/00B4D . . . [N: by reducing in gaseous or solid state (slag reduction [C22B15/00H4](#))]
- C22B15/00B4D2 [N: Segregation]

- C22B15/00H . [N: Pyrometallurgy]
- C22B15/00H2 . . [N: Smelting or converting]
- C22B15/00H2B . . . [N: Bath smelting or converting]
- C22B15/00H2B2 [N: in shaft furnaces, e.g. blast furnaces]
- C22B15/00H2B3 [N: in rotary furnaces, e.g. kaldo-type furnaces]
- C22B15/00H2B4 [N: in reverberatory furnaces]
- C22B15/00H2B6 [N: in electric furnaces]
- C22B15/00H2B8 [N: in converters]
- C22B15/00H2B8B [N: in rotating converters]
- C22B15/00H2B9 [N: in muffles, crucibles, or closed vessels]
- C22B15/00H2F . . . [N: flash smelting or converting]
- C22B15/00H2M . . . [N: in a succession of furnaces]
- C22B15/00H2R . . . [N: Reduction smelting or converting]
- C22B15/00H4 . . [N: Slag, slime, speiss, or dross treating]
- C22B15/00H6 . . [N: Scrap treating]
- C22B15/00H6K . . . [N: Spent catalysts]
- C22B15/00H8 . . [N: working up of molten copper, e.g. refining]

- C22B15/00L . [N: Hydrometallurgy]
- C22B15/00L2 . . [N: Leaching or slurring (with organic compounds [C22B3/16](#))]
- C22B15/00L2A . . . [N: with acids or salts thereof]
- C22B15/00L2A2 [N: containing halogen]
- C22B15/00L2A4 [N: containing sulfur]
- C22B15/00L2A6 [N: containing nitrogen]
- C22B15/00L2A6B [N: Cyanide groups]
- C22B15/00L2D . . . [N: with ammoniacal solutions, e.g. ammonium hydroxide]
- C22B15/00L2F . . . [N: with non-acid solutions containing salts of alkali or alkaline earth metals]
- C22B15/00L2M . . . [N: with water]
- C22B15/00L4 . . [N: Treating solutions (with organic compounds [C22B3/00D](#))]
- C22B15/00L4B . . . [N: by physical methods]
- C22B15/00L4D . . . [N: by chemical methods]
- C22B15/00L4D2 [N: by cementation]
- C22B15/00L4D6 [N: by gases, e.g. hydrogen or hydrogen sulfide]

- C22B15/00P . [N: Process control or regulation methods]
- C22B15/00P2 . . [N: Sulfur release abatement]

C22B17/00 **Obtaining cadmium**

- C22B17/02 . by dry processes

- C22B17/04 . [N: IPC4] by wet processes
- C22B17/06 . Refining
- C22B19/00 Obtaining zinc or zinc oxide**
- C22B19/02 . Preliminary treatment of ores; Preliminary refining of zinc oxide
- C22B19/04 . Obtaining zinc by distilling
- C22B19/06 . . in muffle furnaces
- C22B19/08 . . in blast furnaces
- C22B19/10 . . in reverberatory furnaces
- C22B19/12 . . in crucible furnaces
- C22B19/14 . . in vertical retorts
- C22B19/16 . . Distilling vessels
- C22B19/18 . . . Condensers, Receiving vessels
- C22B19/20 . Obtaining zinc otherwise than by distilling
- C22B19/22 . . [N: IPC4] with leaching with acids
- C22B19/24 . . [N: IPC4] with leaching with alkaline solutions, e.g. ammonia
- C22B19/26 . . [N: IPC4] Refining solutions [N: containing zinc values, e.g.] obtained by leaching zinc ores ([N: treatment or purification of solutions by liquid-liquid extraction, by ion exchange or by adsorption [C22B3/00](#)])
- C22B19/28 . from muffle furnace residues
- C22B19/30 . from metallic residues or scraps
- C22B19/32 . Refining zinc
- C22B19/34 . Obtaining zinc oxide ([purifying zinc oxide C01G9/02](#))
- C22B19/36 . . in blast or reverberatory furnaces
- C22B19/38 . . in rotary furnaces
- C22B21/00 Obtaining aluminium**
- C22B21/00B . [N: Preliminary treatment of ores or scrap or any other metal source ([Bayer processes C01F](#))]
- C22B21/00D . [N: by wet processes ([C22B21/02](#), [C22B21/04](#) and [C22B21/06](#) take precedence)]
- C22B21/00D6 . . [N: from waste materials]
- C22B21/00D6K . . . [N: from spent catalysts]
- C22B21/00F . [N: by other processes ([electrolysis C25C](#); [C22B21/02](#) and [C22B21/04](#) take precedence)]
- C22B21/00F2 . . [N: from aluminium halides]

- C22B21/00F4 . . [N: from other aluminium compounds]
- C22B21/00F4D . . . [N: using metals, e.g. Hg or Mn]
- C22B21/00F6 . . [N: from scrap, skimmings or any secondary source aluminium e.g. recovery of alloy constituents ([C22B21/00F2](#), [C22B21/00F4](#) and [C22B21/00J2](#) take precedence)]
- C22B21/00F6K . . . [N: from spent catalysts]
- C22B21/00J . . [N: melting and handling molten aluminium ([C22B21/02](#), [C22B21/04](#) and [C22B21/06](#) take precedence)]
- C22B21/00J2 . . [N: Remelting scrap, skimmings or any secondary source aluminium]
- C22B21/02 . with reducing [N: ([C22B21/04](#) takes precedence)]
- C22B21/04 . with alkali metals [N: earth alkali metals included]
- C22B21/06 . refining [N: electrolytic refining [C25C](#); ([C22B21/00F2](#), [C22B21/00F4D](#) take precedence)]
- C22B21/06B . . [N: using salt or fluxing agents ([C22B21/06D](#), [C22B21/06F](#), and [C22B21/06H](#) take precedence)]
- C22B21/06D . . [N: using inert or reactive gases ([C22B21/06F](#) and [C22B21/06H](#) take precedence)]
- C22B21/06F . . [N: Treatment of circulating aluminium, e.g. by filtration ([C22B21/06H](#) takes precedence)]
- C22B21/06H . . [N: handling in vacuum]

C22B23/00 **Obtaining nickel or cobalt**

- C22B23/00B . [N: Preliminary treatment of ores, e.g. by roasting or by the Krupp-Renn process]
- C22B23/02 . by dry processes
- C22B23/02B . . [N: by reduction in solid state, e.g. by segregation processes]
- C22B23/02D . . [N: with formation of ferro-nickel or ferro-cobalt]
- C22B23/02F . . [N: with formation of a matte or by matte refining or converting into nickel or cobalt, e.g. by the Oxford process ([leaching of mattes C22B23/04](#))]
- C22B23/02K . . [N: from spent catalysts]
- C22B23/02P . . [N: separation of nickel from cobalt]
- C22B23/04 . [N: IPC4] by wet processes ([N: recovery or separation of nickel or cobalt using organic agents [C22B3/00](#)])
- C22B23/04A . . [N: Leaching processes]
- C22B23/04A1 . . . [N: with acids or salt solutions except ammonium salts solutions]
- C22B23/04A1A [N: Halogenated acids or salts thereof]
- C22B23/04A1B [N: Sulfurated acids or salts thereof]
- C22B23/04A1C [N: Nitric acids or salts thereof]
- C22B23/04A2 . . . [N: with an ammoniacal liquor or with a hydroxide of an alkali or alkaline-earth metal]
- C22B23/04B . . [N: Treatment or purification of solutions, e.g. obtained by leaching ([C22B23/04A](#) takes precedence)]
- C22B23/04B6 . . . [N: by chemical methods]

C22B23/04B6B [N: by chemical substitution, e.g. by cementation]

C22B23/04P . . [N: Separation of nickel from cobalt]

C22B23/04P2 . . . [N: in acidic type solutions]

C22B23/04P4 . . . [N: in ammoniacal type solutions]

C22B23/06 . refining

C22B23/06B . . [N: carbonyl methods]

C22B25/00 **Obtaining tin**

C22B25/02 . by dry processes

C22B25/04 . [N: IPC 4] by wet processes

C22B25/06 . from scrap, especially tin scrap (by electrolytic procedure [C25C1/14](#))

C22B25/08 . Refining

C22B26/00 **Obtaining alkali, alkaline earth metals or magnesium**

C22B26/10 . Obtaining alkali metals

C22B26/12 . . Obtaining lithium

C22B26/20 . Obtaining alkaline earth metals or magnesium

C22B26/22 . . Obtaining magnesium

C22B30/00 **Obtaining antimony, arsenic or bismuth**

C22B30/02 . Obtaining antimony

C22B30/04 . Obtaining arsenic [N: ([C22B3/16](#), [C22B3/00D2](#) and [C22B3/00D4](#) take precedence)]

C22B30/06 . Obtaining bismuth

C22B34/00 **Obtaining refractory metals**

C22B34/10 . Obtaining titanium, zirconium or hafnium

C22B34/12 . . Obtaining titanium [N: or titanium compounds from ores or scrap by metallurgical processing; preparation of titanium compounds from other titanium compounds see [C01G23/00](#) to [C01G23/08](#)]

C22B34/12B . . . [N: preliminary treatment of ores or scrap to eliminate non- titanium constituents, e.g. iron, without attacking the titanium constituent]

C22B34/12B2 [N: by dry processes, e.g. with selective chlorination of iron or with formation of a titanium bearing slag]

C22B34/12B4 [N: by wet processes, e.g. using leaching methods or flotation techniques]

C22B34/12D . . . [N: obtaining titanium or titanium compounds from ores or scrap by dry processes]

- C22B34/12D2 [N: using a halogen containing agent]
- C22B34/12D4 [N: using an oxygen containing agent]
- C22B34/12D6 [N: treatment or purification of titanium containing products obtained by dry processes, e.g. condensation]
- C22B34/12F [N: obtaining titanium or titanium compounds from ores or scrap by wet processes, e.g. by leaching]
- C22B34/12F2 [N: using acidic solutions or liquors]
- C22B34/12F2B [N: containing a halogen ion as active agent]
- C22B34/12F2D [N: containing a sulfur ion as active agent]
- C22B34/12F4 [N: using basic solutions or liquors]
- C22B34/12F6 [N: treatment or purification of titanium containing solutions or liquors or slurries ([C01G23/00B](#) takes precedence)]
- C22B34/12H [N: obtaining metallic titanium from titanium compounds, e.g. by reduction ([C22B34/12J](#) takes precedence)]
- C22B34/12H2 [N: using alkali or alkaline-earth metals or amalgams]
- C22B34/12H2B [N: reduction of titanium halides, e.g. Kroll process]
- C22B34/12H4 [N: using other metals, e.g. Al, Si, Mn]
- C22B34/12H6 [N: using carbon containing agents, e.g. C, CO, carbides (34/12H8 takes precedence)]
- C22B34/12H8 [N: using hydrogen containing agents, e.g. H₂, CaH₂, hydrocarbons]
- C22B34/12J [N: 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]
- C22B34/12R [N: Refining, melting, remelting, working up of titanium]
- C22B34/14 Obtaining zirconium or hafnium [N: Treatment or purification of solutions by liquid-liquid extraction, by ion exchange or by adsorption [C22B3/00](#), [C01G25/00B](#), [C01G27/00B](#)]

- C22B34/20 Obtaining niobium, tantalum or vanadium
- C22B34/22 Obtaining vanadium
- C22B34/22K [N: from spent catalysts]
- C22B34/24 Obtaining niobium or tantalum

- C22B34/30 Obtaining chromium, molybdenum or tungsten
- C22B34/32 Obtaining chromium
- C22B34/32K [N: from spent catalysts]
- C22B34/34 Obtaining molybdenum [N: ([C22B3/00D2](#), [C22B3/00D4](#) and [C01G39/00B](#) take precedence; from catalyst or superalloy scrap : see also [C22B7/00](#))]
- C22B34/34K [N: from spent catalysts]
- C22B34/36 Obtaining tungsten
- C22B34/36K [N: from spent catalysts]

- C22B35/00** **Obtaining beryllium**

- C22B41/00** **Obtaining germanium [N: ([C22B3/00D2](#) and [C22B3/00D4](#) takes precedence)]**

C22B43/00 **Obtaining mercury****C22B47/00** **Obtaining manganese**

- C22B47/00K . [N: from spent catalysts]
- C22B47/00N . [N: Treating ocean floor nodules]
- C22B47/00N1 . . [N: Preliminary treatment]
- C22B47/00N2 . . [N: by dry processes, e.g. smelting]
- C22B47/00N4 . . [N: by wet processes]
- C22B47/00N4A . . . [N: leaching processes]
- C22B47/00N4A1 [N: with acids or salt solutions ([C22B47/00N4A2](#) takes precedence)]
- C22B47/00N4A2 [N: with an ammoniacal liquor or with a hydroxide of an alkali or alkaline-earth metal]
- C22B47/00N4B [N: Treatment or purification of solutions, e.g. obtained by leaching ([C22B47/00N4A](#) takes precedence)]
- C22B47/00N6 . . [N: refining, e.g. separation of metals obtained by the above methods]

C22B58/00 **Obtaining gallium or indium [N: (treatment or purification of solutions by liquid-liquid extraction, by ion exchange or by adsorption [C22B3/00D](#))]****C22B59/00** **Obtaining rare earth metals****C22B60/00** **Obtaining metals of atomic number 87 or higher, i.e. radioactive metals**

- C22B60/02 . Obtaining thorium, uranium, or other actinides
- C22B60/02A . . [N: obtaining uranium]
- C22B60/02A2 . . . [N: preliminary treatment of ores or scrap]
- C22B60/02A4 . . . [N: by dry processes]
- C22B60/02A6 . . . [N: by wet processes]
- C22B60/02A6A [N: by leaching]
- C22B60/02A6A1 [N: using acidic solutions or liquors]
- C22B60/02A6A1A [N: halogenated ion as active agent]
- C22B60/02A6A1B [N: sulfurated ion as active agent]
- C22B60/02A6A1C [N: nitric acid containing ion as active agent]
- C22B60/02A6A1D [N: phosphorated ion as active agent]
- C22B60/02A6A2 [N: using basic solutions or liquors]
- C22B60/02A6B [N: treatment or purification of solutions or of liquors or of slurries ([C22B60/02A6A](#) takes precedence)]
- C22B60/02A6B1 [N: using biological agents, e.g. micro organisms or algae]
- C22B60/02A6B2 [N: liquid-liquid extraction with or without dissolution in organic solvents]
- C22B60/02A6B4 [N: extraction by solid resins]

- C22B60/02A6B4R [N: Extraction by activated carbon containing adsorbents]
- C22B60/02A6B4T [N: Extraction by titanium containing adsorbents, e.g. by hydrous titanium oxide ([C22B60/02A6B4R](#) takes precedence)]
- C22B60/02A6B6 [N: by chemical methods ([C22B60/02A6B1](#), [C22B60/02A6B2](#), or [C22B60/02A6B4](#) take precedence)]
- C22B60/02A6B6P [N: 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]

- C22B60/02A8 [N: refining, melting, remelting, working up uranium]
- C22B60/02D [N: obtaining thorium]
- C22B60/02H [N: obtaining other actinides except plutonium]
- C22B60/04 Obtaining plutonium

- C22B61/00** **Obtaining metals not elsewhere provided for in this subclass (iron [C21](#))**