

CPC COOPERATIVE PATENT CLASSIFICATION

C CHEMISTRY; METALLURGY

(NOTES omitted)

METALLURGY

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

C22C ALLOYS (flints [C06C 15/00](#); treatment of alloys [C21D](#), [C22F](#))

NOTES

- In this subclass, the following terms or expressions are used with the meanings indicated:
 - "alloys" includes also:
 - metallic composite materials containing a substantial proportion of fibres or other somewhat larger particles;
 - ceramic compositions containing free metal bonded to carbides, diamond, oxides, borides, nitrides or silicides, e.g. cermets, or other metal compounds, e.g. oxynitrides or sulfides, other than as macroscopic reinforcing agents;
 - "based on" requires at least 50% by weight of the specified constituent or of the specified group of constituents.
- In the absence of an indication to the contrary, in groups [C22C 5/00](#) - [C22C 32/00](#) an alloy is classified in the last appropriate place.
- In this subclass it is desirable to classify the individual aspects of combinations of processes or materials for powder metallurgy using Combination Sets with symbols chosen from groups [C22C 1/00](#) - [C22C 43/00](#) or from groups [B22F 1/00](#) - [B22F 9/00](#).
- In this subclass the special database "ALLOYS" is used. This system includes patent documents classified in groups [C22C 1/04](#) and [C22C 5/00](#) - [C22C 49/14](#) and provides information on the composition of the alloys, their uses and characteristics.

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:

| | | |
|---|------------|---|
| C22C 101/00 , C22C 101/20 | covered by | C04B 35/62227 |
| C22C 101/02 | covered by | C04B 35/62231 |
| C22C 101/04 | covered by | C04B 35/62236 |
| C22C 101/06 | covered by | C04B 35/62245 |
| C22C 101/08 | covered by | C04B 35/62272 |
| C22C 101/10 | covered by | D01F 9/12 |
| C22C 101/12 | covered by | C04B 35/62277 |
| C22C 101/14 | covered by | C04B 35/62281 |
| C22C 101/16 | covered by | C04B 35/62286 |
| C22C 101/18 | covered by | C04B 35/62295 |
| C22C 101/22 | covered by | C04B 35/6229 |
| C22C 111/00 - C22C 111/02 | covered by | C22C 47/00 , C22C 49/00 |
| C22C 121/00 - C22C 121/02 | covered by | C22C 47/02 - C22C 47/068 , C22C 49/00 |
- 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.

Non-ferrous alloys, i.e. alloys based essentially on metals other than iron (master alloys for iron and steel [C22C 35/00](#); alloys containing radioactive material [C22C 43/00](#); amorphous alloys [C22C 45/00](#); alloys containing fibres or filaments [C22C 47/00](#), [C22C 49/00](#))

- | | |
|-------|---|
| 1/00 | Making alloys (powder-metallurgical apparatus or processes, not specially modified for making alloys B22F ; by electrothermal methods C22B 4/00 ; by electrolysis C25C) |
| 1/002 | . {Making amorphous alloys (processes for making amorphous material by powder metallurgy B22F)} |
| 1/005 | . {Making alloys with holding in the range of the solid-liquid phase} |

- | | |
|--------|--|
| 1/007 | . {Preparing arsenides or antimonides, especially of the III-VI-compound type, e.g. aluminium or gallium arsenide} |
| 1/02 | . by melting {(C22C 1/1036 takes precedence)} |
| 1/023 | . . {Alloys based on nickel} |
| 1/026 | . . {Alloys based on aluminium} |
| 1/03 | . . using master alloys |
| 1/04 | . by powder metallurgy (C22C 1/08 , { C22C 1/05 , C22C 1/10 , C22C 32/00 , C22C 47/00 , C22C 49/00 } take precedence) |
| 1/0408 | . . {Light metal alloys} |
| 1/0416 | . . . {Aluminium-based alloys} |
| 1/0425 | . . {Copper-based alloys} |
| 1/0433 | . . {Nickel- or cobalt-based alloys} |

| | | | |
|---|---|--|---|
| 1/0441 | . . . {Alloys based on intermetallic compounds of the type rare earth - Co, Ni} | 1/1042 | . . . {by atomising (atomising molten metal B22F 9/08)} |
| 1/045 | . . {Alloys based on refractory metals} | 2001/1047 | . . . {by mixing and casting liquid metal matrix composites} |
| 1/0458 | . . . {Alloys based on titanium, zirconium, hafnium} | 2001/1052 | {by mixing and casting metal matrix composites with reaction} |
| 1/0466 | . . {Alloys based on noble metals} | 2001/1057 | . . . {Reactive infiltration} |
| 1/0475 | . . {Impregnated alloys} | 2001/1063 | {Gas reaction, e.g. lanxide} |
| 1/0483 | . . {Alloys based on the low melting point metals Zn, Pb, Sn, Cd, In or Ga} | 1/1068 | . . . {Making hard metals based on borides, carbides, nitrides, oxides, silicides} |
| 1/0491 | . . {comprising intermetallic compounds (C22C 1/0441 takes precedence)} | 2001/1073 | . . . {Infiltration or casting under mechanical pressure, e.g. squeeze casting} |
| 1/05 | . . Mixtures of metal powder with non-metallic powder (C22C 1/08, {C22C 47/00, C22C 49/00} take precedence) | 1/1078 | . . {by internal oxidation of material in solid state} |
| 1/051 | . . . {Making hard metals based on borides, carbides, nitrides, oxides or silicides; Preparation of the powder mixture used as the starting material} | 1/1084 | . . {by mechanical alloying (blending, milling)} |
| 1/053 | {with <u>in situ</u> forming of the hard compound (C22C 1/058 takes precedence)} | 2001/1089 | . . {by partial reduction or decomposition of a solid metal compound} |
| 1/055 | {using carbon} | 1/1094 | . . {comprising an after-treatment} |
| 1/056 | {using gas} | NOTE | |
| 1/058 | . . . {by reaction sintering (i.e. gasless reaction starting from a mixture of solid metal compounds)} | Documents classified in group C22C 1/1094 are also classified in subclass C22F | |
| 1/06 | . with the use of special agents for refining or deoxidising | 3/00 | Removing material from alloys to produce alloys of different constitution {separation of the constituents of alloys} |
| 1/08 | . Alloys with open or closed pores {(by powder metallurgy B22F 3/11)} | 3/005 | . {Separation of the constituents of alloys} |
| 2001/081 | . . {Casting porous metals into porous preform skelet without foaming} | 5/00 | Alloys based on noble metals |
| 2001/082 | . . . {with removal of the preform} | 5/02 | . Alloys based on gold |
| 2001/083 | . . {Foaming process in molten metal other than by powder metallurgy} | 5/04 | . Alloys based on a platinum group metal |
| 2001/085 | . . . {with external pressure or pressure buildup to make porous metals} | 5/06 | . Alloys based on silver |
| 2001/086 | . . . {Gas foaming process} | 5/08 | . . with copper as the next major constituent |
| 2001/087 | . . . {after casting in solidified or solidifying metal to make porous metals} | 5/10 | . . with cadmium as the next major constituent |
| 2001/088 | . . {Foaming process with solid metal other than by powder metallurgy} | 7/00 | Alloys based on mercury |
| 1/10 | . Alloys containing non-metals ({C22C 1/05}, C22C 1/08, {C22C 47/00, C22C 49/00} take precedence) | 9/00 | Alloys based on copper |
| 1/1005 | . . {Pretreatment of the non-metallic additives (pretreatment of non-metallic fibres C22C 47/02)} | 9/01 | . with aluminium as the next major constituent |
| WARNING | | 9/02 | . with tin as the next major constituent |
| Groups C22C 1/1005, C22C 1/101 and C22C 1/1015 are not complete, see also C22C 1/10 | | 9/04 | . with zinc as the next major constituent |
| 1/101 | . . . {by coating} | 9/05 | . with manganese as the next major constituent |
| 1/1015 | . . . {by preparing or treating a non-metallic additive preform} | 9/06 | . with nickel or cobalt as the next major constituent |
| 2001/1021 | {the preform being ceramic} | 9/08 | . with lead as the next major constituent |
| 1/1026 | . . {starting from a solution or a suspension of (a) compound(s) of at least one of the alloy constituents} | 9/10 | . with silicon as the next major constituent |
| 1/1031 | . . {starting from (a) gaseous compound(s) or (a) vapour(s) of at least one of the constituents} | 11/00 | Alloys based on lead |
| 1/1036 | . . {starting from a melt (infiltration of sintered ceramic preforms with molten metal C04B 41/51)} | 11/02 | . with an alkali or an alkaline earth metal as the next major constituent |
| | | 11/04 | . with copper as the next major constituent |
| | | 11/06 | . with tin as the next major constituent |
| | | 11/08 | . with antimony or bismuth as the next major constituent |
| | | 11/10 | . . with tin |
| | | 12/00 | Alloys based on antimony or bismuth |
| | | 13/00 | Alloys based on tin |
| | | 13/02 | . with antimony or bismuth as the next major constituent |
| | | 14/00 | Alloys based on titanium |
| | | 16/00 | Alloys based on zirconium |
| | | 18/00 | Alloys based on zinc |
| | | 18/02 | . with copper as the next major constituent |
| | | 18/04 | . with aluminium as the next major constituent |

| | | | |
|--------------|--|--------------|--|
| 19/00 | Alloys based on nickel or cobalt | 27/025 | . . {alloys based on vanadium} |
| 19/002 | . {with copper as the next major constituent} | 27/04 | . Alloys based on tungsten or molybdenum |
| 19/005 | . {with Manganese as the next major constituent} | 27/06 | . Alloys based on chromium |
| 19/007 | . {with a light metal (alkali metal Li, Na, K, Rb, Cs; earth alkali metal Be, Mg, Ca, Sr, Ba, Al Ga, Ge, Ti) or B, Si, Zr, Hf, Sc, Y, lanthanides, actinides, as the next major constituent} | 28/00 | Alloys based on a metal not provided for in groups C22C 5/00 - C22C 27/00 |
| 19/03 | . based on nickel | 29/00 | Alloys based on carbides, oxides, nitrides, borides, or silicides, e.g. cermets, or other metal compounds, e.g. oxynitrides, sulfides {(C22C 26/00 takes precedence)} |
| 19/05 | . . with chromium | 29/005 | . {comprising a particular metallic binder} |
| 19/051 | . . . {and Mo or W} | 29/02 | . based on carbides or carbonitrides |
| 19/052 | {with the maximum Cr content being at least 40% } | 29/04 | . . based on carbonitrides |
| 19/053 | {with the maximum Cr content being at least 30% but less than 40% } | 29/06 | . . based on carbides, but not containing other metal compounds |
| 19/055 | {with the maximum Cr content being at least 20% but less than 30% } | 29/062 | . . . {based on B ₄ C} |
| 19/056 | {with the maximum Cr content being at least 10% but less than 20% } | 29/065 | . . . {based on SiC} |
| 19/057 | {with the maximum Cr content being less 10% } | 29/067 | . . . {comprising a particular metallic binder} |
| 19/058 | . . . {without Mo and W} | 29/08 | . . . based on tungsten carbide |
| 19/07 | . based on cobalt | 29/10 | . . . based on titanium carbide |
| 20/00 | Alloys based on cadmium | 29/12 | . based on oxides |
| 21/00 | Alloys based on aluminium | 29/14 | . based on borides |
| 21/003 | . {containing at least 2.6% of one or more of the elements: tin, lead, antimony, bismuth, cadmium, and titanium} | 29/16 | . based on nitrides {(containing cubic BN or wurtzitic BN and diamond C22C 26/00)} |
| 21/006 | . {containing Hg} | 29/18 | . based on silicides |
| 21/02 | . with silicon as the next major constituent | 30/00 | Alloys containing less than 50% by weight of each constituent |
| 21/04 | . . Modified aluminium-silicon alloys | 30/02 | . containing copper |
| 21/06 | . with magnesium as the next major constituent | 30/04 | . containing tin or lead |
| 21/08 | . . with silicon | 30/06 | . containing zinc |
| 21/10 | . with zinc as the next major constituent | 32/00 | Non-ferrous alloys containing at least 5% by weight but less than 50% by weight of oxides, carbides, borides, nitrides, silicides or other metal compounds, e.g. oxynitrides, sulfides whether added as such or formed <u>in situ</u> |
| 21/12 | . with copper as the next major constituent | | NOTE |
| 21/14 | . . with silicon | | This group comprises also dispersion hardened alloys with less than 5% of dispersed compounds |
| 21/16 | . . with magnesium | | |
| 21/18 | . . with zinc | | |
| 22/00 | Alloys based on manganese | | |
| 23/00 | Alloys based on magnesium | 32/0005 | . {with at least one oxides and at least one of carbides, nitrides, borides or silicides as the main non-metallic constituents} |
| 23/02 | . with aluminium as the next major constituent | 32/001 | . {with only oxides} |
| 23/04 | . with zinc or cadmium as the next major constituent | 32/0015 | . . {with only single oxides as main non-metallic constituents} |
| 23/06 | . with a rare earth metal as the next major constituent | 32/0021 | . . . {Matrix based on noble metals, Cu or alloys thereof} |
| 24/00 | Alloys based on an alkali or an alkaline earth metal | 32/0026 | . . . {Matrix based on Ni, Co, Cr or alloys thereof; Matrix based on Fe for ODS steels (matrix based on Fe for steels other than ODS C22C 33/00 , by powder metallurgy C22C 33/02)} |
| 25/00 | Alloys based on beryllium | 32/0031 | . . . {Matrix based on refractory metals, W, Mo, Nb, Hf, Ta, Zr, Ti, V or alloys thereof} |
| 26/00 | Alloys containing diamond {or cubic or wurtzitic boron nitride, fullerenes or carbon nanotubes} | 32/0036 | . . . {Matrix based on Al, Mg, Be or alloys thereof} |
| 2026/001 | . {Fullerenes} | 32/0042 | . . . {Matrix based on low melting metals, Pb, Sn, In, Zn, Cd or alloys thereof} |
| 2026/002 | . {Carbon nanotubes} | 32/0047 | . {with carbides, nitrides, borides or silicides as the main non-metallic constituents} |
| 2026/003 | . {Cubic boron nitrides only} | 32/0052 | . . {only carbides} |
| 2026/005 | . {with additional metal compounds being borides} | 32/0057 | . . . {based on B ₄ C} |
| 2026/006 | . {with additional metal compounds being carbides} | 32/0063 | . . . {based on SiC} |
| 2026/007 | . {with additional metal compounds being nitrides} | | |
| 2026/008 | . {with additional metal compounds other than carbides, borides or nitrides} | | |
| 27/00 | Alloys based on rhenium or a refractory metal not mentioned in groups C22C 14/00 or C22C 16/00 | | |
| 27/02 | . Alloys based on vanadium, niobium, or tantalum | | |

- 32/0068 . . {only nitrides}
- 32/0073 . . {only borides}
- 32/0078 . . {only silicides}
- 32/0084 . {carbon or graphite as the main non-metallic constituent}
- 32/0089 . {with other, not previously mentioned inorganic compounds as the main non-metallic constituent, e.g. sulfides, glass}
- 32/0094 . {with organic materials as the main non-metallic constituent, e.g. resin}

Ferrous alloys, i.e. alloys based on iron (alloys containing radioactive material [C22C 43/00](#); amorphous alloys [C22C 45/00](#); alloys containing fibres or filaments [C22C 47/00](#), [C22C 49/00](#); heat treatment thereof [C21D](#))

33/00 Making ferrous alloys

- 33/003 . {making amorphous alloys}
- 33/006 . {compositions used for making ferrous alloys}
- 33/02 . by powder metallurgy ([working metallic powder B22F](#))
- 33/0207 . . {Using a mixture of prealloyed powders or a master alloy (mixtures of metal powder in general [B22F 1/0003](#))}
- 33/0214 . . . {comprising P or a phosphorus compound}
- 33/0221 . . . {comprising S or a sulfur compound}
- 33/0228 . . . {comprising other non-metallic compounds or more than 5% of graphite}
- 33/0235 . . {Starting from compounds, e.g. oxides (manufacture of articles starting from powder comprising reducible metal compounds in general [B22F 3/001](#))}
- 33/0242 . . {using the impregnating technique ([impregnating articles in general B22F 3/26](#))}
- 33/025 . . {having an intermetallic of the REM-Fe type which is not magnetic}
- 33/0257 . . {characterised by the range of the alloying elements}
- 33/0264 . . . {the maximum content of each alloying element not exceeding 5%}
- 33/0271 {with only C, Mn, Si, P, S, As as alloying elements, e.g. carbon steel}
- 33/0278 . . . {with at least one alloying element having a minimum content above 5%}
- 33/0285 {with Cr, Co, or Ni having a minimum content higher than 5%}
- 33/0292 {with more than 5% preformed carbides, nitrides or borides}
- 33/04 . by melting
- 33/06 . . using master alloys
- 33/08 . Making cast-iron alloys
- 33/10 . . including procedures for adding magnesium
- 33/12 . . . by fluidised injection

35/00 Master alloys for iron or steel

- 35/005 . {based on iron, e.g. ferro-alloys}

NOTE

In the absence of an indication to the contrary, in groups [C22C 37/00](#) - [C22C 38/00](#) an alloy is classified in the last appropriate place that provides for one of the alloying components.

37/00 Cast-iron alloys

- 37/04 . containing spheroidal graphite

- 37/06 . containing chromium
- 37/08 . . with nickel
- 37/10 . containing aluminium or silicon

38/00 Ferrous alloys, e.g. steel alloys ([cast-iron alloys C22C 37/00](#))

- 38/001 . {containing N}
- 38/002 . {containing In, Mg, or other elements not provided for in one single group [C22C 38/001](#) - [C22C 38/60](#)}
- 38/004 . {Very low carbon steels, i.e. having a carbon content of less than 0,01%}
- 38/005 . {containing rare earths, i.e. Sc, Y, Lanthanides}
- 38/007 . {containing silver}
- 38/008 . {containing tin}
- 38/02 . containing silicon
- 38/04 . containing manganese
- 38/06 . containing aluminium
- 38/08 . containing nickel {([C22C 38/105](#) takes precedence)}
- 38/10 . containing cobalt
- 38/105 . . {containing Co and Ni}
- 38/12 . containing tungsten, tantalum, molybdenum, vanadium, or niobium
- 38/14 . containing titanium or zirconium
- 38/16 . containing copper
- 38/18 . containing chromium
- 38/20 . . with copper
- 38/22 . . with molybdenum or tungsten
- 38/24 . . with vanadium
- 38/26 . . with niobium or tantalum
- 38/28 . . with titanium or zirconium
- 38/30 . . with cobalt
- 38/32 . . with boron
- 38/34 . . with more than 1.5% by weight of silicon
- 38/36 . . with more than 1.7% by weight of carbon
- 38/38 . . with more than 1.5% by weight of manganese
- 38/40 . . with nickel
- 38/42 . . . with copper
- 38/44 . . . with molybdenum or tungsten
- 38/46 . . . with vanadium
- 38/48 . . . with niobium or tantalum
- 38/50 . . . with titanium or zirconium
- 38/52 . . . with cobalt
- 38/54 . . . with boron
- 38/56 . . . with more than 1.7% by weight of carbon
- 38/58 . . . with more than 1.5% by weight of manganese
- 38/60 . containing lead, selenium, tellurium, or antimony, or more than 0.04% by weight of sulfur

43/00 Alloys containing radioactive materials

45/00 Amorphous alloys

- 45/001 . {with Cu as the major constituent}
- 45/003 . {with one or more of the noble metals as major constituent}
- 45/005 . {with Mg as the major constituent}
- 45/006 . {with Cr as the major constituent}
- 45/008 . {with Fe, Co or Ni as the major constituent ([C22C 45/02](#), [C22C 45/04](#) take precedence)}
- 45/02 . with iron as the major constituent
- 45/04 . with nickel or cobalt as the major constituent
- 45/06 . with beryllium as the major constituent
- 45/08 . with aluminium as the major constituent

- 45/10 . with molybdenum, tungsten, niobium, tantalum, titanium, or zirconium {or Hf} as the major constituent

Alloys containing fibres or filaments

WARNING

The subgroups of [C22C 47/00](#) and [C22C 49/00](#) might be incomplete as some of the patent documents classified [C22C 47/08](#), [C22C 47/16](#) and [C22C 49/00](#) might need reclassification to one or more subgroups or to [C22C 47/02](#) and subgroups

47/00 Making alloys containing metallic or non-metallic fibres or filaments

- 2047/005 . {Working of filaments or rods into fibre reinforced metal by mechanical deformation}
- 47/02 . Pretreatment of the fibres or filaments
- 47/025 . . {Aligning or orienting the fibres}
- 47/04 . . by coating, e.g. with a protective or activated covering
- 47/06 . . by forming the fibres or filaments into a preformed structure, e.g. using a temporary binder to form a mat-like element
- 47/062 . . . {from wires or filaments only}

WARNING

Not complete, see also [C22C 47/02](#)

- 47/064 {Winding wires}
- 47/066 {Weaving wires}
- 47/068 {Aligning wires}
- 47/08 . by contacting the fibres or filaments with molten metal, e.g. by infiltrating the fibres or filaments placed in a mould {(C22C 47/16 takes precedence)}
- 47/10 . . Infiltration in the presence of a reactive atmosphere; Reactive infiltration
- 47/12 . . Infiltration or casting under mechanical pressure
- 47/14 . by powder metallurgy, i.e. by processing mixtures of metal powder and fibres or filaments
- 47/16 . by thermal spraying of the metal, e.g. plasma spraying {(atomising molten metal comprising fibres see also C22C 1/1042)}
- 47/18 . . using a preformed structure of fibres or filaments
- 47/20 . by subjecting to pressure and heat an assembly comprising at least one metal layer or sheet and one layer of fibres or filaments
- 2047/205 . . {placing wires inside grooves of a metal layer}

49/00 Alloys containing metallic or non-metallic fibres or filaments

- 49/02 . characterised by the matrix material
- 49/04 . . Light metals
- 49/06 . . . Aluminium
- 49/08 . . Iron group metals
- 49/10 . . Refractory metals
- 49/11 . . . Titanium
- 49/12 . . Intermetallic matrix material

- 49/14 . characterised by the fibres or filaments

2200/00 Crystalline structure

- 2200/02 . Amorphous
- 2200/04 . Nanocrystalline
- 2200/06 . Quasicrystalline

Non-ferrous alloys, i.e. alloys based essentially on metals other than iron (master alloys for iron and steel [C22C 35/00](#); alloys containing radioactive material [C22C 43/00](#); amorphous alloys [C22C 45/00](#); alloys containing fibres or filaments [C22C 47/00](#), [C22C 49/00](#))

2202/00 Physical properties

- 2202/02 . Magnetic
- 2202/04 . Hydrogen absorbing

2204/00 End product comprising different layers, coatings or parts of cermet