

# 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:
 

<a href="#">C22C 101/00</a> , <a href="#">C22C 101/20</a>	covered by	<a href="#">C04B 35/62227</a>
<a href="#">C22C 101/02</a>	covered by	<a href="#">C04B 35/62231</a>
<a href="#">C22C 101/04</a>	covered by	<a href="#">C04B 35/62236</a>
<a href="#">C22C 101/06</a>	covered by	<a href="#">C04B 35/62245</a>
<a href="#">C22C 101/08</a>	covered by	<a href="#">C04B 35/62272</a>
<a href="#">C22C 101/10</a>	covered by	<a href="#">D01F 9/12</a>
<a href="#">C22C 101/12</a>	covered by	<a href="#">C04B 35/62277</a>
<a href="#">C22C 101/14</a>	covered by	<a href="#">C04B 35/62281</a>
<a href="#">C22C 101/16</a>	covered by	<a href="#">C04B 35/62286</a>
<a href="#">C22C 101/18</a>	covered by	<a href="#">C04B 35/62295</a>
<a href="#">C22C 101/22</a>	covered by	<a href="#">C04B 35/6229</a>
<a href="#">C22C 111/00</a> - <a href="#">C22C 111/02</a>	covered by	<a href="#">C22C 47/00</a> , <a href="#">C22C 49/00</a>
<a href="#">C22C 121/00</a> - <a href="#">C22C 121/02</a>	covered by	<a href="#">C22C 47/02</a> - <a href="#">C22C 47/068</a> , <a href="#">C22C 49/00</a>
- In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

**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  | <b>Making alloys</b> (powder-metallurgical apparatus or processes, not specially modified for making alloys <a href="#">B22F</a> ; by electrothermal methods <a href="#">C22B 4/00</a> ; by electrolysis <a href="#">C25C</a> ) |
| 1/002 | . {Making amorphous alloys (processes for making amorphous material by powder metallurgy <a href="#">B22F</a> )}  |
| 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 {( <a href="#">C22C 1/1036</a> takes precedence)}   |
| 1/023  | . . {Alloys based on nickel}   |
| 1/026  | . . {Alloys based on aluminium}  |
| 1/03   | . . using master alloys  |
| 1/04   | . by powder metallurgy ( <a href="#">C22C 1/08</a> , { <a href="#">C22C 1/05</a> , <a href="#">C22C 1/10</a> , <a href="#">C22C 32/00</a> , <a href="#">C22C 47/00</a> , <a href="#">C22C 49/00</a> } 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 <a href="#">B22F 9/08</a> )}
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 ( <a href="#">C22C 1/0441</a> takes precedence)}	2001/1073	. . . {Infiltration or casting under mechanical pressure, e.g. squeeze casting}
1/05	. . Mixtures of metal powder with non-metallic powder ( <a href="#">C22C 1/08</a> , { <a href="#">C22C 47/00</a> , <a href="#">C22C 49/00</a> } 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 ( <a href="#">C22C 1/058</a> 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}	<b>NOTE</b>	
1/058	. . . {by reaction sintering (i.e. gasless reaction starting from a mixture of solid metal compounds)}	Documents classified in group <a href="#">C22C 1/1094</a> are also classified in subclass <a href="#">C22F</a>	
1/06	. with the use of special agents for refining or deoxidising	3/00	<b>Removing material from alloys to produce alloys of different constitution {separation of the constituents of alloys}</b>
1/08	. Alloys with open or closed pores {(by powder metallurgy <a href="#">B22F 3/11</a> )}	3/005	. {Separation of the constituents of alloys}
2001/081	. . {Casting porous metals into porous preform skelet without foaming}	5/00	<b>Alloys based on noble metals</b>
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	<b>Alloys based on mercury</b>
1/10	. Alloys containing non-metals ({ <a href="#">C22C 1/05</a> }, <a href="#">C22C 1/08</a> , { <a href="#">C22C 47/00</a> , <a href="#">C22C 49/00</a> } take precedence)	9/00	<b>Alloys based on copper</b>
1/1005	. . {Pretreatment of the non-metallic additives (pretreatment of non-metallic fibres <a href="#">C22C 47/02</a> )}	9/01	. with aluminium as the next major constituent
<b>WARNING</b>		9/02	. with tin as the next major constituent
Groups <a href="#">C22C 1/1005</a> , <a href="#">C22C 1/101</a> and <a href="#">C22C 1/1015</a> are not complete, see also <a href="#">C22C 1/10</a>		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	<b>Alloys based on lead</b>
1/1036	. . {starting from a melt (infiltration of sintered ceramic preforms with molten metal <a href="#">C04B 41/51</a> )}	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	<b>Alloys based on antimony or bismuth</b>
		13/00	<b>Alloys based on tin</b>
		13/02	. with antimony or bismuth as the next major constituent
		14/00	<b>Alloys based on titanium</b>
		16/00	<b>Alloys based on zirconium</b>
		18/00	<b>Alloys based on zinc</b>
		18/02	. with copper as the next major constituent
		18/04	. with aluminium as the next major constituent

<b>19/00</b>	<b>Alloys based on nickel or cobalt</b>	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}	<b>28/00</b>	<b>Alloys based on a metal not provided for in groups <a href="#">C22C 5/00</a> - <a href="#">C22C 27/00</a></b>
19/03	. based on nickel	<b>29/00</b>	<b>Alloys based on carbides, oxides, nitrides, borides, or silicides, e.g. cermets, or other metal compounds, e.g. oxynitrides, sulfides {(<a href="#">C22C 26/00</a> takes precedence)}</b>
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 <sub>4</sub> 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
<b>20/00</b>	<b>Alloys based on cadmium</b>	29/12	. based on oxides
<b>21/00</b>	<b>Alloys based on aluminium</b>	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 <a href="#">C22C 26/00</a> )}
21/006	. {containing Hg}	29/18	. based on silicides
21/02	. with silicon as the next major constituent	<b>30/00</b>	<b>Alloys containing less than 50% by weight of each constituent</b>
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	<b>32/00</b>	<b>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></b>
21/12	. with copper as the next major constituent		<b>NOTE</b>
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		
<b>22/00</b>	<b>Alloys based on manganese</b>		
<b>23/00</b>	<b>Alloys based on magnesium</b>	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}
<b>24/00</b>	<b>Alloys based on an alkali or an alkaline earth metal</b>	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 <a href="#">C22C 33/00</a> , by powder metallurgy <a href="#">C22C 33/02</a> )}
<b>25/00</b>	<b>Alloys based on beryllium</b>	32/0031	. . . {Matrix based on refractory metals, W, Mo, Nb, Hf, Ta, Zr, Ti, V or alloys thereof}
<b>26/00</b>	<b>Alloys containing diamond {or cubic or wurtzitic boron nitride, fullerenes or carbon nanotubes}</b>	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 <sub>4</sub> 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}		
<b>27/00</b>	<b>Alloys based on rhenium or a refractory metal not mentioned in groups <a href="#">C22C 14/00</a> or <a href="#">C22C 16/00</a></b>		
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

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

#### Alloys containing fibres or filaments

##### **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}
- 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

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##### **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