

**CPC****COOPERATIVE PATENT CLASSIFICATION****B22F**

**WORKING METALLIC POWDER; MANUFACTURE OF ARTICLES FROM METALLIC POWDER; MAKING METALLIC POWDER** ( processes or devices for granulating materials in general [B01J 2/00](#); making ceramics by compacting or sintering [C04B](#), e.g. [C04B 35/64](#); for the production of metals as such, see class [C22](#); reduction or decomposition of metal compounds in general [C22B](#); making alloys by powder metallurgy [C22C](#); electrolytic production of metal powder [C25C 5/00](#) )

**NOTE**

This subclass covers the making of metallic powder only insofar as powder with specific physical characteristics is made;

In this subclass, the following terms or expressions are used with the meanings indicated:

- "metallic powder" covers powders containing a substantial proportion of non-metallic material;
- "powder" includes somewhat larger particles which are worked, obtained or behave in a manner similar to powder, e.g. fibres.

**WARNING**

1. The following IPC groups are not used in the CPC scheme. Subject matter covered by these groups is classified in the following CPC groups:  
[B22F 3/035](#) covered by [B22F 3/03](#)

**B22F 1/00**

**Special treatment of metallic powder, e.g. to facilitate working, to improve properties** { ( treatment of powder by mechanical means, e.g. by grinding, milling, rolling [B22F 9/04](#) )}; **Metallic powders per se, e.g. mixtures of particles of different composition** ( [C04](#), [C08](#) take precedence; { amorphous powder [B22F 9/002](#) } )

**B22F 1/0003**

- . { Metallic powders per se; Mixtures of metallic powders; Metallic powders mixed with a lubricating or binding agent ( making ferrous alloys using a mixture of prealloyed powders [C22C 33/0207](#) )}

**B22F 1/0007**

- .. { Metallic powder characterised by its shape or structure, e.g. fibre structure }

**B22F 1/0011**

- ... { Metallic powder characterised by size or surface area only }

**WARNING**

Groups [B22F 1/0011](#) and [B22F 1/0014](#) are not complete, see also [B22F 1/0007](#)

**B22F 1/0014**

- .... { by size mixtures or distribution }

**B22F 1/0018**

- .... { Nanometer sized particles }

**B22F 1/0022**

- ..... { Dispersions or suspensions thereof }{ WARNING: Not complete, see also [B22F 1/0018](#) }

**B22F 1/0025**

- ..... { Nanofibres or nanotubes }{ WARNING: Not complete, see also [B22F 1/0018](#) }

**B22F 1/004**

- ... { Fibre structure ( [B22F 1/0025](#) takes precedence )}

- B22F 1/0044 . . . { Nanometer size structures }
- B22F 1/0048 . . . { Spherical powder }
- B22F 1/0051 . . . . { Hollow particles }
- B22F 1/0055 . . . { Flake form powders } { WARNING: Not complete, see also [B22F 1/0007](#) }
- B22F 1/0059 . . { Metallic powders mixed with a lubricating or binding agent or organic material }
- B22F 1/0062 . . . { Powders coated with organic material }
- B22F 1/007 . . . { Non-organic or metal salt binders or lubricants }
- B22F 1/0074 . . . { Organic materials comprising a solvent e.g. for slip casting }
- B22F 1/0077 . . . { Mixtures obtained by warm mixing }
  
- B22F 1/0081 . { Special treatment of metallic powder, e.g. to facilitate working, to improve properties ( coating with organic material [B22F 1/0062](#) ) }
- B22F 1/0085 . . { Thermal or thermo-mechanical treatment }
- B22F 1/0088 . . { Chemical treatment, e.g. passivation }
- B22F 1/0096 . . { Treatment resulting in the production of agglomerates }
  
- B22F 1/02 . . comprising coating of the powder { ( coating with organic material [B22F 1/0062](#); chemical surface treatment [B22F 1/0088](#) ) }
- B22F 1/025 . . { Metallic coating }
  
- B22F 3/00** **Manufacture of workpieces or articles from metallic powder characterised by the manner of compacting or sintering; Apparatus specially adapted therefor; { Presses and furnaces }**
  
- B22F 3/001 . { Starting from powder comprising reducible metal compounds ( making ferrous alloys starting from compounds [C22C 33/0235](#) ) }
- B22F 3/002 . { Manufacture of articles essentially made from metallic fibres }
- B22F 3/003 . { Apparatus, e.g. furnaces ( in general [F27B](#) ) }
- B22F 3/004 . { Filling molds with powder ( feeding material to presses in general [B30B 15/302](#) ) }
- B22F 3/005 . { Loading or unloading powder metal objects ( transport in general [B65G](#) ) }
- B22F 3/006 . { Amorphous articles }
- B22F 3/007 . . { by diffusion starting from non-amorphous articles prepared by powder metallurgy }
  
- B22F 3/008 . { Selective deposition modelling ( [B22F 3/1055](#) takes precedence ) }
  
- B22F 3/02 . Compacting only
- B22F 3/03 . . Press-moulding apparatus therefor
- B22F 3/04 . . by applying fluid pressure { e.g. by cold isostatic pressing [CIP] }
- B22F 3/045 . . . { Semi-isostatic pressure }
- B22F 3/06 . . by centrifugal forces
- B22F 3/08 . . by explosive forces { ( generating shock waves in general [G10K 15/043](#) ) }

- B22F 3/087 .. using high energy impulses, e.g. magnetic field impulses
- B22F 3/093 .. using vibrations { or friction }
- B22F 3/10 . Sintering only
- B22F 3/1003 .. { Use of special medium during sintering, e.g. sintering aid }
- B22F 3/1007 ... { Atmosphere ( [B22F 3/1021](#) takes precedence ) }
- B22F 3/101 .... { Changing atmosphere }
- B22F 3/1017 .. { Multiple heating or additional steps ( [B22F 3/101](#) takes precedence ) }
- B22F 3/1021 ... { Removal of binder or filler ( removal of binder from ceramics [C04B 35/638](#) ) }
- B22F 3/1025 .... { not by heating only }
- B22F 3/1028 ... { Controlled cooling }
- B22F 3/1035 .. { Liquid phase sintering }
- B22F 3/1039 .. { by reaction ( [B22F 3/001](#), [B22F 3/23](#) take precedence ) }
- B22F 3/105 .. by using electric current { other than for infra-red radiant energy }, laser radiation or plasma ( [B22F 3/11](#) takes precedence ); { by ultrasonic bonding ( [B22F 3/115](#) takes precedence ) }
- B22F 3/1055 ... { Selective sintering, i.e. stereolithography ( selective sintering of powdered plastics [B29C 67/0077](#) ) }
- B22F 3/11 .. Making porous workpieces or articles
- B22F 3/1103 ... { with particular physical characteristics }
- B22F 3/1109 .... { Inhomogenous pore distribution ( composite layers of porous nature [B22F 7/002](#) ) }
- B22F 3/1112 .... { comprising hollow spheres or hollow fibres }
- B22F 3/1115 .... { comprising complex forms, e.g. honeycombs }
- B22F 3/1118 .... { comprising internal reinforcements }
- B22F 3/1121 ... { by using decomposable, meltable or sublimatable fillers }
- B22F 3/1125 .... { involving a foaming process }
- B22F 3/1134 .... { Inorganic fillers ( carbonaceous or paper filler [B22F 3/1121](#) ) }
- B22F 3/1137 .... { by coating porous removable preforms }
- B22F 3/114 ... { the porous products being formed by impregnation ( [B22F 3/1137](#), [B22F 3/26](#) take precedence ) }
- B22F 3/1143 ... { involving an oxidation, reduction or reaction step }
- B22F 3/1146 ... { After-treatment maintaining the porosity ( [B22F 3/114](#) takes precedence ) }
- B22F 3/115 . by spraying molten metal, i.e. spray sintering, spray casting {( also classified in [C23C 4/121](#), [C23C 4/185](#) ) }
- B22F 3/12 . Both compacting and sintering ( by forging [B22F 3/17](#) )
- B22F 3/1208 .. { Containers or coating used therefor }
- B22F 3/1216 ... { Container composition }
- B22F 3/1225 .... { Glass }
- B22F 3/1233 .... { Organic material }
- B22F 3/1241 .... { layered }
- B22F 3/125 ... { Initially porous container }
- B22F 3/1258 ... { Container manufacturing }

- B22F 3/1266 . . . . { by coating or sealing the surface of the preformed article, e.g. by melting }
- B22F 3/1275 . . . . { by coating a model and eliminating the model before consolidation }
- B22F 3/1283 . . . . { Container formed as an undeformable model eliminated after consolidation }
- B22F 3/1291 . . . . { Solid insert eliminated after consolidation }
- B22F 3/14 . . . simultaneously
- B22F 3/15 . . . Hot isostatic pressing
- B22F 3/156 . . . . { by a pressure medium in liquid or powder form }
- B22F 3/16 . . . in successive or repeated steps { WARNING: Subgroups of [B22F 3/16](#) are not complete, see also [B22F 3/16](#) }
- B22F 3/162 . . . { Machining, working after consolidation }
- B22F 3/164 . . . { Partial deformation or calibration }
- B22F 3/168 . . . . { Local deformation }
  
- B22F 3/17 . . by forging
- B22F 3/172 . . { Continuous compaction, e.g. rotary hammering ( with axial pressure and without reduction of section [B22F 3/204](#) ) }
- B22F 3/177 . . { Rocking die forging }
  
- B22F 3/18 . . by using pressure rollers
  
- B22F 3/20 . . by extruding
- B22F 3/204 . . { Continuous compaction with axial pressure and without reduction of section }
  
- B22F 3/22 . . for producing castings from a slip
- B22F 3/222 . . { by freeze-casting or in a supercritical fluid }
- B22F 3/225 . . { by injection molding } [WARNING: Not complete, see also [B22F 3/22](#)]
- B22F 3/227 . . { by organic binder assisted extrusion } { WARNING: Not complete, see also [B22F 3/22](#) }
  
- B22F 3/23 . . involving a self-propagating high-temperature synthesis or reaction sintering step { ( making cermets by reaction sintering [C22C 1/058](#) ) }
  
- B22F 3/24 . . After-treatment of workpieces or articles { ( [B22F 3/1146](#) takes precedence ) }
- B22F 3/26 . . Impregnating { ( making ferrous alloys by impregnation [C22C 33/0242](#) ) }
  
- B22F 5/00** **Manufacture of workpieces or articles from metallic powder characterised by the special shape of the product**
  
- B22F 5/003 . . { Articles made for being fractured or separated into parts }
  
- B22F 5/006 . . { of flat products, e.g. sheets ( [B22F 3/1103](#) takes precedence; by using pressure rollers only see [B22F 3/18](#) ) }
  
- B22F 5/007 . . { of moulds }
  
- B22F 5/008 . . { of engine cylinder parts or of piston parts other than piston rings ( of piston rings [B22F 5/02](#) ) }

- B22F 5/009 . { of turbine components other than turbine blades ( of turbine blades [B22F 5/04](#) ) }
- B22F 5/02 . of piston rings
- B22F 5/04 . of turbine blades
- B22F 5/06 . of threaded articles, e.g. nuts
- B22F 5/08 . of toothed articles, e.g. gear wheels; of cam discs
- B22F 5/085 . . { with helical contours }
- B22F 5/10 . of articles with cavities or holes, not otherwise provided for in the preceding subgroups
- B22F 5/106 . . { Tube or ring forms } { WARNING: Not complete, see also [B22F 5/10](#) }
- B22F 5/12 . of wires { ( of tubes [B22F 5/10](#) ) }
  
- B22F 7/00** **Manufacture of composite layers, workpieces, or articles, comprising metallic powder, by sintering the powder, with or without compacting { wherein at least one part is obtained by sintering or compression ( application of coating layers by use of metal powders, see [C23C](#) ) }**
- B22F 7/002 . { of porous nature }
- B22F 7/004 . . { comprising at least one non-porous part }
- B22F 7/006 . . . { the porous part being obtained by foaming }
- B22F 7/008 . { characterised by the composition }
- B22F 7/02 . of composite layers { ( [B22F 7/002](#) takes precedence ) }
- B22F 7/04 . . with one or more layers not made from powder, e.g. made from solid metal
- B22F 7/06 . of composite workpieces or articles from parts, e.g. to form tipped tools { ( [B22F 7/002](#) takes precedence ) }
- B22F 7/062 . . { involving the connection or repairing of preformed parts }
- B22F 7/064 . . . { using an intermediate powder layer }
- B22F 7/08 . . with one or more parts not made from powder { ( [B22F 7/062](#) takes precedence ) }
  
- B22F 8/00** **Manufacture of articles from scrap or waste metal particles**
  
- B22F 9/00** **Making metallic powder or suspensions thereof**
- B22F 9/002 . { amorphous or microcrystalline }
- B22F 9/004 . . { by diffusion, e.g. solid state reaction }
- B22F 9/005 . . . { Transformation into amorphous state by milling }
- B22F 9/007 . . { Transformation of amorphous into microcrystalline state }
- B22F 9/008 . . { Rapid solidification processing }
- B22F 9/02 . using physical processes

- B22F 9/023 . . { Hydrogen absorption }
- B22F 9/026 . . { Spray drying of solutions or suspensions }
- B22F 9/04 . . starting from solid material, e.g. by crushing, grinding or milling ( { C22C 1/1084 takes precedence } ; crushing, grinding or milling, in general, see the relevant subclasses, e.g. B02C )
- B22F 9/06 . . starting from liquid material
- B22F 9/08 . . . . by casting, e.g. through sieves or in water, by atomising or spraying ( using electric discharge B22F 9/14 )
- B22F 9/082 . . . . { atomising using a fluid ( using centrifugal force B22F 9/10 ) }
- B22F 9/10 . . . . using centrifugal force
- B22F 9/12 . . starting from gaseous material
- B22F 9/14 . . using electric discharge
- B22F 9/16 . using chemical processes
- B22F 9/18 . . with reduction of metal compounds
- B22F 9/20 . . . . starting from solid metal compounds
- B22F 9/22 . . . . using gaseous reductors
- B22F 9/24 . . . . starting from liquid metal compounds, e.g. solutions
- B22F 9/26 . . . . using gaseous reductors
- B22F 9/28 . . . . starting from gaseous metal compounds
- B22F 9/30 . . with decomposition of metal compounds, e.g. by pyrolysis
- B22F 9/305 . . . { of metal carbonyls }
- B22F 2001/00** **Special treatment of metallic powder, e.g. to facilitate working, to improve properties ( { treatment of powder by mechanical means, e.g. by grinding, milling, rolling B22F 9/04 } ); Metallic powders per se, e.g. mixtures of particles of different composition ( C04, C08 take precedence; { amorphous powder B22F 9/002 } )**
- B22F 2001/0003 . { Metallic powders per se; Mixtures of metallic powders; Metallic powders mixed with a lubricating or binding agent ( making ferrous alloys using a mixture of prealloyed powders C22C 33/0207 ) }
- B22F 2001/0007 . . { Metallic powder characterised by its shape or structure, e.g. fibre structure }
- B22F 2001/0011 . . . { Metallic powder characterised by size or surface area only }

**WARNING**

Groups [B22F 1/0011](#) and [B22F 1/0014](#) are not complete, see also [B22F 1/0007](#)

- B22F 2001/0018 . . . . { Nanometer sized particles }
- B22F 2001/0029 . . . . . Hollow particles, including tubes and shells
- B22F 2001/0033 . . . . . Flake form nanoparticles
- B22F 2001/0037 . . . . . Complex form nanoparticles , e.g.. prism, pyramid, octahedron
- B22F 2001/0059 . . { Metallic powders mixed with a lubricating or binding agent or organic material }
- B22F 2001/0066 . . . Organic binder comprising a mixture or obtained by reaction of more than one component other than solvent, lubricant

- B22F 2001/0081 . { Special treatment of metallic powder, e.g. to facilitate working, to improve properties ( coating with organic material [B22F 1/0062](#) ) }
- B22F 2001/0088 .. { Chemical treatment, e.g. passivation }
- [B22F 2001/0092](#) ... Making a dispersion
  
- B22F 2003/00** **Manufacture of workpieces or articles from metallic powder characterised by the manner of compacting or sintering; Apparatus specially adapted therefor; { Presses and furnaces }**
  
- B22F 2003/02 . Compacting only
- [B22F 2003/023](#) .. Lubricant mixed with the metal powder
- [B22F 2003/026](#) .. Mold wall lubrication or article surface lubrication
- B22F 2003/03 .. Press-moulding apparatus therefor
- [B22F 2003/031](#) ... with punches moving in different directions in different planes
- [B22F 2003/033](#) ... with multiple punches working in the same direction
  
- B22F 2003/10 . Sintering only
- B22F 2003/1003 .. { Use of special medium during sintering, e.g. sintering aid }
- [B22F 2003/1014](#) ... Getter
- [B22F 2003/1032](#) .. comprising a grain growth inhibitor
- [B22F 2003/1042](#) .. with support for articles to be sintered
- [B22F 2003/1046](#) ... with separating means for articles to be sintered
- B22F 2003/105 .. by using electric current { other than for infra-red radiant energy }, laser radiation or plasma ( [B22F 3/11](#) takes precedence ); { by ultrasonic bonding ( [B22F 3/115](#) takes precedence ) }
- [B22F 2003/1051](#) ... by electric discharge
- [B22F 2003/1052](#) ... assisted by energy absorption enhanced by the coating or powder
- [B22F 2003/1053](#) ... by induction
- [B22F 2003/1054](#) ... by microwave
- B22F 2003/1055 ... { Selective sintering, i.e. stereolithography ( selective sintering of powdered plastics [B29C 67/0077](#) ) }
- [B22F 2003/1056](#) .... Apparatus components, details or accessories
- [B22F 2003/1057](#) ..... for control or data processing, e.g. algorithms
- [B22F 2003/1058](#) ..... Support structures for the 3D object during manufacturing, e.g. using sacrificial material
- [B22F 2003/1059](#) ..... for cleaning or recycling
- B22F 2003/11 .. Making porous workpieces or articles
- B22F 2003/1103 ... { with particular physical characteristics }
- [B22F 2003/1106](#) .... Product comprising closed porosity
- B22F 2003/1121 ... { by using decomposable, meltable or sublimatable fillers }
- B22F 2003/1125 .... { involving a foaming process }
- [B22F 2003/1128](#) ..... Foaming by expansion of dissolved gas, other than with foaming agent
- [B22F 2003/1131](#) ..... Foaming in a liquid suspension and decomposition
  
- B22F 2003/12 . Both compacting and sintering ( by forging [B22F 3/17](#) )



B22F 2003/14	..	simultaneously
<a href="#">B22F 2003/145</a>	...	by warm compacting, below debinding temperature
B22F 2003/15	...	Hot isostatic pressing
<a href="#">B22F 2003/153</a>	....	apparatus specific to HIP
B22F 2003/16	..	in successive or repeated steps { <b>WARNING: Subgroups of <a href="#">B22F 3/16</a> are not complete, see also <a href="#">B22F 3/16</a></b> }
B22F 2003/164	...	{ <b>Partial deformation or calibration</b> }
<a href="#">B22F 2003/166</a>	....	Surface calibration, blasting, burnishing, sizing, coining
B22F 2003/17	.	by forging
<a href="#">B22F 2003/175</a>	..	by hot forging, below sintering temperature
B22F 2003/18	.	by using pressure rollers
<a href="#">B22F 2003/185</a>	..	by hot rolling, below sintering temperature
B22F 2003/20	.	by extruding
<a href="#">B22F 2003/202</a>	..	with back pressure
<a href="#">B22F 2003/206</a>	..	Hydrostatic or hydraulic extrusion
<a href="#">B22F 2003/208</a>	..	Warm or hot extruding
B22F 2003/24	.	After-treatment of workpieces or articles {( <a href="#">B22F 3/1146</a> takes precedence )}
<a href="#">B22F 2003/241</a>	..	Chemical after-treatment on the surface
<a href="#">B22F 2003/242</a>	...	Coating
<a href="#">B22F 2003/244</a>	...	Leaching
<a href="#">B22F 2003/245</a>	..	Making recesses, grooves etc on the surface by removing material
<a href="#">B22F 2003/247</a>	..	Removing material: carving, cleaning, grinding, hobbing, honing, lapping, polishing, milling, shaving, skiving, turning the surface
<a href="#">B22F 2003/248</a>	..	Thermal after-treatment
<b>B22F 2005/00</b>		<b>Manufacture of workpieces or articles from metallic powder characterised by the special shape of the product</b>
<a href="#">B22F 2005/001</a>	.	Cutting tools, earth boring or grinding tool other than table ware
<a href="#">B22F 2005/002</a>	.	Tools other than cutting tools
<a href="#">B22F 2005/004</a>	.	Article comprising helical form elements ( <a href="#">B22F 5/085</a> takes precedence )
<a href="#">B22F 2005/005</a>	.	Article surface comprising protrusions
B22F 2005/10	.	of articles with cavities or holes, not otherwise provided for in the preceding subgroups
<a href="#">B22F 2005/103</a>	..	Cavity made by removal of insert
<b>B22F 2007/00</b>		<b>Manufacture of composite layers, workpieces, or articles, comprising metallic powder, by sintering the powder, with or without compacting { wherein at least one part is obtained by sintering or compression ( application of coating layers by use of metal powders, see <a href="#">C23C</a> ) }</b>



B22F 2007/02	. of composite layers ({ <a href="#">B22F 7/002 takes precedence</a> })
B22F 2007/04	.. with one or more layers not made from powder, e.g. made from solid metal
<a href="#">B22F 2007/042</a>	... characterised by the layer forming method
<a href="#">B22F 2007/045</a>	.... accompanied by fusion or impregnation
<a href="#">B22F 2007/047</a>	.... non-pressurised baking of the paste or slurry containing metal powder
B22F 2007/06	. of composite workpieces or articles from parts, e.g. to form tipped tools ({ <a href="#">B22F 7/002 takes precedence</a> })
B22F 2007/062	.. { involving the connection or repairing of preformed parts }
<a href="#">B22F 2007/066</a>	... using impregnation
<a href="#">B22F 2007/068</a>	... repairing articles
<b>B22F 2009/00</b>	<b>Making metallic powder or suspensions thereof</b>
<a href="#">B22F 2009/001</a>	. from scrap particles
B22F 2009/02	. using physical processes
B22F 2009/04	.. starting from solid material, e.g. by crushing, grinding or milling ({ <a href="#">C22C 1/1084 takes precedence</a> }; <a href="#">crushing, grinding or milling, in general, see the relevant subclasses, e.g. B02C</a> )
<a href="#">B22F 2009/041</a>	... by mechanical alloying , e.g. blending, milling
<a href="#">B22F 2009/042</a>	... using a particular milling fluid
<a href="#">B22F 2009/043</a>	... by ball milling
<a href="#">B22F 2009/044</a>	... by jet milling
<a href="#">B22F 2009/045</a>	... by other means than ball or jet milling
<a href="#">B22F 2009/046</a>	.... by cutting
<a href="#">B22F 2009/047</a>	.... by rolling
<a href="#">B22F 2009/048</a>	... by pulverising a quenched ribbon
<a href="#">B22F 2009/049</a>	... by pulverising at particular temperature
B22F 2009/06	.. starting from liquid material
<a href="#">B22F 2009/065</a>	... Melting inside a liquid, e.g. making spherical balls
B22F 2009/08	... by casting, e.g. through sieves or in water, by atomising or spraying ( <a href="#">using electric discharge B22F 9/14</a> )
<a href="#">B22F 2009/0804</a>	.... Dispersion in or on liquid, other than with sieves
<a href="#">B22F 2009/0808</a>	..... Mechanical dispersion of melt, e.g. by sieves
<a href="#">B22F 2009/0812</a>	..... Pulverisation with a moving liquid coolant stream, by centrifugally rotating stream
<a href="#">B22F 2009/0816</a>	.... by casting with pressure or pulsating pressure on the metal bath
B22F 2009/082	.... { <a href="#">atomising using a fluid ( using centrifugal force B22F 9/10 )</a> }
<a href="#">B22F 2009/0824</a>	..... with a specific atomising fluid
<a href="#">B22F 2009/0828</a>	..... with water
<a href="#">B22F 2009/0832</a>	..... Handling of atomising fluid, e.g. heating, cooling, cleaning, recirculating
<a href="#">B22F 2009/0836</a>	..... with electric or magnetic field or induction
<a href="#">B22F 2009/084</a>	..... combination of methods

B22F 2009/0844	.....	in controlled atmosphere
B22F 2009/0848	.....	Melting process before atomisation
B22F 2009/0852	.....	Electroslag melting
B22F 2009/0856	.....	Skull melting
B22F 2009/086	.....	Cooling after atomisation
B22F 2009/0864	.....	by oil, other non-aqueous fluid or fluid-bed cooling
B22F 2009/0868	.....	by injection of solid particles in the melt stream
B22F 2009/0872	.....	by water
B22F 2009/0876	.....	by gas
B22F 2009/088	.....	Fluid nozzles , e.g. angle, distance
B22F 2009/0884	.....	Spiral fluid
B22F 2009/0888	.....	casting construction of the melt process, apparatus, intermediate reservoir e.g. tundish, devices for temperature control
B22F 2009/0892	.....	casting nozzle; controlling metal stream in or after the casting nozzle
B22F 2009/0896	.....	particle transport, separation: process and apparatus
B22F 2009/16	.	using chemical processes
B22F 2009/165	..	Chemical reaction in an Ionic Liquid [IL] ( <a href="#">B22F 2009/245</a> takes precedence )
B22F 2009/18	..	with reduction of metal compounds
B22F 2009/24	...	starting from liquid metal compounds, e.g. solutions
B22F 2009/245	....	Reduction reaction in an Ionic Liquid [IL]

## **B22F 2201/00      Treatment under specific atmosphere**

B22F 2201/01	.	Reducing atmosphere
B22F 2201/013	..	Hydrogen
B22F 2201/016	..	NH3
B22F 2201/02	.	Nitrogen
B22F 2201/03	.	Oxygen
B22F 2201/04	.	CO or CO2
B22F 2201/05	.	Water or water vapour
B22F 2201/10	.	Inert gases
B22F 2201/11	..	Argon
B22F 2201/12	..	Helium
B22F 2201/20	.	Use of vacuum
B22F 2201/30	.	Carburising atmosphere
B22F 2201/32	.	Decarburising atmosphere
B22F 2201/40	.	Metal compounds

B22F 2201/50 . air

**B22F 2202/00 Treatment under specific physical conditions**

B22F 2202/01 . Use of vibrations

B22F 2202/03 . Treatment under cryogenic or supercritical conditions

B22F 2202/05 . Use of magnetic field

B22F 2202/06 . Use of electric fields

B22F 2202/07 . by induction

B22F 2202/09 . Use of non-gravitational conditions

B22F 2202/11 . Use of irradiation

B22F 2202/13 . Use of plasma

B22F 2202/15 . Use of fluidised beds

B22F 2202/17 . use of centrifugal or vortex forces

**B22F 2203/00 Controlling**

B22F 2203/01 . To-be-deleted with administrative transfer to [B22F 2203/00](#)

B22F 2203/03 . for feed-back

B22F 2203/05 . thermal expansion

B22F 2203/11 . temperature, temperature profile

B22F 2203/13 . pressure

B22F 2203/15 . weight

**B22F 2207/00 Aspects of the compositions, gradients**

B22F 2207/01 . Composition gradients

B22F 2207/03 . . of the metallic binder phase in cermets

B22F 2207/05 . . . eta-phase

B22F 2207/07 . . Particles with core-rim gradient

B22F 2207/11 . Gradients other than composition gradients, e.g. size gradients

B22F 2207/13 . . Size gradients

B22F 2207/15 . . Temperature gradients

B22F 2207/17 . . density or porosity gradients

B22F 2207/20 . Cooperating components

**B22F 2301/00 Metallic composition of the powder or its coating**

B22F 2301/05 . Light metals

B22F 2301/052 . . Aluminium

B22F 2301/054 . . Alkali metals, i.e. Li, Na, K, Rb, Cs, Fr

B22F 2301/056 . . Alkaline metals, i.e. Ca, Sr, Ba, Ra

B22F 2301/058 . . Magnesium

B22F 2301/10 . Copper

B22F 2301/15 . Nickel or cobalt

B22F 2301/155 . . Rare Earth - Co or -Ni intermetallic alloys

B22F 2301/20 . Refractory metals

B22F 2301/205 . . Titanium, zirconium or hafnium

B22F 2301/25 . Noble metals, i.e. Ag Au, Ir, Os, Pd, Pt, Rh, Ru

B22F 2301/255 . . Silver or gold

B22F 2301/30 . Low melting point metals, i.e. Zn, Pb, Sn, Cd, In, Ga

B22F 2301/35 . Iron

B22F 2301/355 . . Rare Earth - Fe intermetallic alloys

B22F 2301/40 . Intermetallics other than rare earth-Co or -Ni or -Fe intermetallic alloys

B22F 2301/45 . Rare earth metals, i.e. Sc, Y, Lanthanides (57-71)

**B22F 2302/00 Metal Compound , non-Metallic compound or non-metal composition of the powder or its coating**

B22F 2302/05 . Boride

B22F 2302/10 . Carbide

B22F 2302/105 . . Silicium carbide (SiC)

B22F 2302/15 . Carbonitride

B22F 2302/20 . Nitride

B22F 2302/205 . Cubic boron nitride

B22F 2302/25 . Oxide

B22F 2302/253 . . Aluminum oxide (Al<sub>2</sub>O<sub>3</sub>)

B22F 2302/256	. . Silicium oxide (SiO <sub>2</sub> )
B22F 2302/30	. Oxynitride
B22F 2302/35	. Complex boride, carbide, carbonitride, nitride, oxide or oxynitride
B22F 2302/40	. Carbon, graphite
B22F 2302/403	. . Carbon nanotube
B22F 2302/406	. . Diamond
B22F 2302/45	. Others, including non-metals
<b>B22F 2303/00</b>	<b>Functional details of metal or compound in the powder or product,</b>
B22F 2303/01	. Main component
B22F 2303/05	. Compulsory alloy component
B22F 2303/10	. Optional alloy component
B22F 2303/15	. Intermetallic
B22F 2303/20	. Coating by means of particles
B22F 2303/25	. Coating by means of fibres
B22F 2303/30	. Coating alloy
B22F 2303/35	. Molten metal infiltrating a metal preform
B22F 2303/40	. Layer in a composite stack of layers, workpiece or article
B22F 2303/405	. . Support layer
B22F 2303/45	. Part of a final mixture to be processed further
<b>B22F 2304/00</b>	<b>Physical aspects of the powder</b>
B22F 2304/05	. Submicron size particles
B22F 2304/052	. . Particle size below 1nm
B22F 2304/054	. . Particle size between 1 and 100 nm
B22F 2304/056	. . Particle size above 100 nm up to 300 nm
B22F 2304/058	. . Particle size above 300 nm up to 1 micrometer
B22F 2304/10	. Micron size particles, i.e. above 1 micrometer up to 500 micrometer
B22F 2304/15	. Millimeter size particles, i.e. above 500 micrometer
<b>B22F 2998/00</b>	<b>Supplementary information concerning processes or compositions relating to powder metallurgy</b>

B22F 2998/10 . Processes characterised by the sequence of their steps

B22F 2999/00 **Aspects linked to processes or compositions used in powder metallurgy**