

**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](#)

**Guidance heading:**

- 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 <a href="#">B22F 3/16</a> are not complete, see also <a href="#">B22F 3/16</a> }
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 <a href="#">B22F 3/204</a> ) }
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 <a href="#">B22F 3/22</a> ]
B22F 3/227	.. { by organic binder assisted extrusion } { WARNING: Not complete, see also <a href="#">B22F 3/22</a> }
B22F 3/23	. involving a self-propagating high-temperature synthesis or reaction sintering step { (making cermets by reaction sintering <a href="#">C22C 1/058</a> ) }
B22F 3/24	. After-treatment of workpieces or articles { ( <a href="#">B22F 3/1146</a> takes precedence) }
B22F 3/26	.. Impregnating { (making ferrous alloys by impregnation <a href="#">C22C 33/0242</a> ) }
<b>B22F 5/00</b>	<b>Manufacture of workpieces or articles from metallic powder characterised by the special shape of the product</b>
B22F 5/003	. {Articles made for being fractured or separated into parts }
B22F 5/006	. {of flat products, e.g. sheets ( <a href="#">B22F 3/1103</a> takes precedence; by using pressure rollers only see <a href="#">B22F 3/18</a> ) }
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 }

#### Guidance heading:

- 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 <a href="#">B22F 1/0062</a> ) }
B22F 2001/0088	..	{Chemical treatment, e.g. passivation }
B22F 2001/0092	...	Making a dispersion
<b>B22F 2003/00</b>		<b>Manufacture of workpieces or articles from metallic powder characterised by the manner of compacting or sintering; Apparatus specially adapted therefor; {Presses and furnaces }</b>
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 ( <a href="#">B22F 3/11</a> takes precedence) ; {by ultrasonic bonding ( <a href="#">B22F 3/115</a> 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 <a href="#">B29C 67/0077</a> ) }
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 <a href="#">B22F 3/17</a> )
B22F 2003/14	..	simultaneously
B22F 2003/145	...	by warm compacting, below debinding temperature
B22F 2003/15	...	Hot isostatic pressing
B22F 2003/153	....	apparatus specific to HIP
B22F 2003/16	..	in successive or repeated steps { WARNING: Subgroups of <a href="#">B22F 3/16</a> are not complete, see also <a href="#">B22F 3/16</a> }
B22F 2003/164	...	{ Partial deformation or calibration }
B22F 2003/166	....	Surface calibration, blasting, burnishing, sizing, coining
B22F 2003/17	.	by forging
B22F 2003/175	..	by hot forging, below sintering temperature
B22F 2003/18	.	by using pressure rollers
B22F 2003/185	..	by hot rolling, below sintering temperature
B22F 2003/20	.	by extruding
B22F 2003/202	..	with back pressure
B22F 2003/206	..	Hydrostatic or hydraulic extrusion
B22F 2003/208	..	Warm or hot extruding
B22F 2003/24	.	After-treatment of workpieces or articles { ( <a href="#">B22F 3/1146</a> takes precedence) }
B22F 2003/241	..	Chemical after-treatment on the surface
B22F 2003/242	...	Coating
B22F 2003/244	...	Leaching
B22F 2003/245	..	Making recesses, grooves etc on the surface by removing material
B22F 2003/247	..	Removing material: carving, cleaning, grinding, hobbing, honing, lapping, polishing, milling, shaving, skiving, turning the surface
B22F 2003/248	..	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>
B22F 2005/001	.	Cutting tools, earth boring or grinding tool other than table ware
B22F 2005/002	.	Tools other than cutting tools
B22F 2005/004	.	Article comprising helical form elements ( <a href="#">B22F 5/085</a> takes precedence)
B22F 2005/005	.	Article surface comprising protrusions
B22F 2005/10	.	of articles with cavities or holes, not otherwise provided for in the preceding subgroups
B22F 2005/103	..	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</a> takes precedence) }
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</a> takes precedence) }
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</a> takes precedence } ; crushing, grinding or milling, in general, see the relevant subclasses, e.g. <a href="#">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 <a href="#">B22F 9/14</a></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	. . . . { atomising using a fluid ( <a href="#">using centrifugal force <a href="#">B22F 9/10</a></a> ) }
<a href="#">B22F 2009/0824</a>	. . . . . with a specific atomising fluid

B22F 2009/0828	.....	with water
B22F 2009/0832	.....	Handling of atomising fluid, e.g. heating, cooling, cleaning, recirculating
B22F 2009/0836	.....	with electric or magnetic field or induction
B22F 2009/084	.....	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]

#### Guidance heading:

#### **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

**Guidance heading:**

**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

#### Guidance heading:

#### **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)

#### Guidance heading:

#### **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

**Guidance heading:**

**B22F 2998/00**      **Supplementary information concerning processes or compositions relating to powder metallurgy**

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

**Guidance heading:**

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