

**CPC****COOPERATIVE PATENT CLASSIFICATION****C09C**

**TREATMENT OF INORGANIC MATERIALS, OTHER THAN FIBROUS FILLERS, TO ENHANCE THEIR PIGMENTING OR FILLING PROPERTIES** (preparation of inorganic compounds or non-metallic elements [C01](#) ; treatment of materials specially adapted to enhance their filling properties in mortars, concrete or artificial stone [C04B 14/00](#), [C04B 18/00](#), [C04B 20/00](#)) ; **PREPARATION OF CARBON BLACK**; {Preparation of inorganic materials which are no single chemical compounds and which are mainly used as pigments or fillers }

**NOTE**

In this subclass, in the absence of an indication to the contrary, a compound is classified in the last appropriate place

Treatment by polymerisation onto particle is classified in [C08F 292/00](#). Only treatment by already polymerised agents is classified in [C09C](#)

Whenever in groups [C09C 1/00](#) to [C09C 1/66](#) the materials consist of a particulate core bearing a coating or any other deposit, classification is done only according to the composition of the core, unless otherwise stated, e.g. [C09C 1/0015](#), [C09C 1/0078](#)

Preparations of those materials which are no single chemical compounds comprise those of many ceramic pigments ([C09C 1/0009](#)), consisting of solid solutions or polycrystalline structures, and those defined as composite materials ([C09C 1/0081](#))

Preparation and treatment steps are not always easy to distinguish from each other, e.g. preparation in the presence of treating agents (by precipitation or calcination), precise reacting conditions, affecting pigmentary effects. It is common practice to include these complex topics in [C09C 1/00](#) while avoiding redundancy

When classifying in this subclass, the indexing codes of subclass M01P are used to identify structural or physical aspects of solid inorganic compounds

**WARNING**

The following IPC groups are not used in the CPC scheme. Subject matter covered by these groups is classified in the following CPC groups:

[C09C 1/68](#) covered by [C09K 3/14](#)

**Guidance heading:****C09C 1/00**

**Treatment of specific inorganic materials other than fibrous fillers (luminescent or tenebrescent materials [C09K](#) ) ; Preparation of carbon black**

**C09C 1/0003**

. {Compounds of molybdenum ([C09C 1/0015](#) takes precedence) }

**C09C 1/0006**

. {containing bismuth and vanadium ([C09C 1/0015](#) takes precedence) }

- C09C 1/0009 . {Pigments for ceramics ([C09C 1/0015](#), [C09C 1/0078](#) take precedence) }
- C09C 1/0012 .. {containing zirconium and silicon }
- C09C 1/0015 . { Pigments exhibiting interference colours, e.g. transparent platelets of appropriate thinness or flaky substrates, e.g. mica, bearing appropriate thin transparent coatings ([C09C 1/0078](#), [C09C 1/62](#) take precedence) }

### **NOTE**

1. The optical properties of the interference pigments are depending on the order of the different layers applied on the substrate in view of their refractive indices; A refractive index  $< \text{or} = 1.8$  is considered low, a refractive index  $> 1.8$  is considered high; A dye is always an organic, coloured material. An aluminium lake compound would for classification purposes also fall under this definition, as well as any coloured metal chelate or metal complex with organic ligands; An interference pigment can e.g. have a flaky, spherical or ellipsoidal core; A pigment comprising a core consisting of a metal is only considered as an interference pigment if it shows properties typical for interference pigments
2. In groups [C09C 1/0015](#) to [C09C 1/0075](#) it is desirable to add indexing codes relating to the compositional and structural details chosen from groups [C09C 2200/00](#) to [C09C 2220/20](#)

- C09C 1/0018 .. {uncoated and unlayered plate-like particles }
- C09C 1/0021 .. { comprising a core coated with only one layer having a high or low refractive index }
- C09C 1/0024 .. { comprising a stack of coating layers with alternating high and low refractive indices, wherein the first coating layer on the core surface has the high refractive index }
- C09C 1/0027 ... { One layer consisting of at least one sub-stoichiometric inorganic compound }
- C09C 1/003 ... { comprising at least one light-absorbing layer }
- C09C 1/0033 .... { consisting of a metal or an alloy }
- C09C 1/0036 .... { consisting of at least one dye }
- C09C 1/0039 .... { consisting of at least one coloured inorganic material }
- C09C 1/0042 ..... { Sub-stoichiometric inorganic materials }
- C09C 1/0045 .... { consisting of a carbonaceous material, e.g. carbon black, graphite, SWNT, MWNT incorporated within an inorganic material }
- C09C 1/0048 ... { comprising at least one optically active layer with at least one organic material layer, e.g. liquid crystal polymers }
- C09C 1/0051 .. { comprising a stack of coating layers with alternating low and high refractive indices, wherein the first coating layer on the core surface has the low refractive index }
- C09C 1/0054 ... { one layer consisting of at least one sub-stoichiometric inorganic compound }
- C09C 1/0057 ... { comprising at least one light-absorbing layer }
- C09C 1/006 .... { consisting of a metal or an alloy }
- C09C 1/0063 .... { consisting of at least one dye }
- C09C 1/0066 .... { consisting of at least one coloured inorganic material }
- C09C 1/0069 ..... { Sub-stoichiometric inorganic materials }
- C09C 1/0072 .... { consisting of a carbonaceous material, e.g. carbon black, graphite, SWNT, MWNT incorporated within an inorganic material }
- C09C 1/0075 ... { comprising at least one optically active layer with at least one organic material }

layer, e.g. liquid crystal polymers }

- C09C 1/0078 . {Pigments consisting of flaky, non-metallic substrates, characterised by a surface-region containing free metal }
- C09C 1/0081 . {Composite particulate pigments or fillers, i.e. containing at least two solid phases, except those consisting of coated particles of one compound ([C09C 1/0015](#), [C09C 1/0078](#) take precedence) }
- C09C 1/0084 .. {containing titanium dioxide }
- C09C 1/0087 ... {only containing titanium dioxide and silica or silicate }
- C09C 1/009 .. {whose phases only contain calcium, magnesium and carbonate ions and may contain hydroxyl ions }
- C09C 1/0093 .. {whose phases only contain calcium ions, carbonate ions and silicate ions or silica }
- C09C 1/0096 . {Compounds of antimony ([C09C 1/0015](#), [C09C 1/0078](#) take precedence) }
- C09C 1/02 . Compounds of alkaline earth metals or magnesium { ([C09C 1/0003](#), [C09C 1/0009](#), [C09C 1/0015](#), [C09C 1/0078](#) take precedence; dolomitic solids [C09C 1/009](#)) }
- C09C 1/021 .. {Calcium carbonates }
- C09C 1/022 ... {Treatment with inorganic compounds }
- C09C 1/024 .... {Coating }
- C09C 1/025 .. {Calcium sulfates }
- C09C 1/027 .. {Barium sulfates }
- C09C 1/028 .. {Compounds containing only magnesium as metal }
- C09C 1/04 . Compounds of zinc { ([C09C 1/0003](#), [C09C 1/0009](#), [C09C 1/0015](#), [C09C 1/0078](#) take precedence) }
- C09C 1/043 .. {Zinc oxide }
- C09C 1/046 .. {containing phosphorus }
- C09C 1/06 .. Lithopone
- C09C 1/08 .. Zinc chromate
- C09C 1/10 . Compounds of cadmium { ([C09C 1/0009](#), [C09C 1/0015](#), [C09C 1/0078](#) take precedence) }
- C09C 1/12 .. Cadmium suphosenide
- C09C 1/14 . Compounds of lead { ([C09C 1/0009](#), [C09C 1/0015](#), [C09C 1/0078](#) take precedence) }
- C09C 1/16 .. White lead
- C09C 1/18 .. Red lead
- C09C 1/20 .. Lead chromate
- C09C 1/22 . Compounds of iron { ([C09C 1/0009](#), [C09C 1/0015](#), [C09C 1/0078](#) take precedence) }
- C09C 1/24 .. Oxides of iron
- C09C 1/245 ... {of plate-like shape }
- C09C 1/26 .. Iron blues
- C09C 1/28 . Compounds of silicon { ([C09C 1/0009](#), [C09C 1/0015](#), [C09C 1/0078](#) take precedence) }

C09C 1/30      ..      Silicic acid

### **NOTE**

Combinations of treatment steps, characterised by the sequence or the nature of two or more individual steps, are classified in [C09C 1/30P](#).

The individual steps are classified with symbols chosen from groups [C09C 1/3009](#) to [C09C 1/3081](#).

- |             |      |  |
|-------------|------|--|
| C09C 1/3009 | ...  | {Physical treatment, e.g. grinding; treatment with ultrasonic vibrations }   |
| C09C 1/3018 | .... | {Grinding }  |
| C09C 1/3027 | .... | {Drying, calcination }   |
| C09C 1/3036 | .... | {Agglomeration, granulation, pelleting }   |
| C09C 1/3045 | ...  | {Treatment with inorganic compounds }  |
| C09C 1/3054 | .... | {Coating }   |
| C09C 1/3063 | ...  | {Treatment with low-molecular organic compounds }  |
| C09C 1/3072 | ...  | {Treatment with macro-molecular organic compounds }  |
| C09C 1/3081 | ...  | {Treatment with organo-silicon compounds }   |
| C09C 1/309  | ...  | {Combinations of treatments provided for in groups <a href="#">C09C 1/3009</a> to <a href="#">C09C 1/3081</a> }  |
| C09C 1/32   | ..   | Ultramarine  |
| C09C 1/34   | .    | Compounds of chromium { ( <a href="#">C09C 1/0009</a> , <a href="#">C09C 1/0015</a> , <a href="#">C09C 1/0078</a> , <a href="#">C09C 1/08</a> , <a href="#">C09C 1/20</a> take precedence) } |
| C09C 1/343  | ..   | {containing silicon or associated with silicon containing material, except when silicon only occurs in a thin coating of the particles }   |
| C09C 1/346  | ..   | {Chromium oxides }   |
| C09C 1/36   | .    | Compounds of titanium { ( <a href="#">C09C 1/0009</a> , <a href="#">C09C 1/0015</a> , <a href="#">C09C 1/0078</a> take precedence) }   |
| C09C 1/3607 | ..   | { Titanium dioxide }   |

### **NOTE**

Combinations of treatment steps, characterised by the sequence or the nature of two or more individual steps, are classified in [C09C 1/36P](#).

The individual steps are classified with symbols chosen from groups [C09C 1/3615](#) to [C09C 1/3684](#).

- |             |      |  |
|-------------|------|--|
| C09C 1/3615 | ...  | {Physical treatment, e.g. grinding, treatment with ultrasonic vibrations } |
| C09C 1/3623 | .... | {Grinding }  |
| C09C 1/363  | .... | {Drying, calcination }   |
| C09C 1/3638 | .... | {Agglomeration, granulation, pelleting }                                   |
| C09C 1/3646 | .... | {Densifying, degassing, packaging }  |
| C09C 1/3653 | ...  | {Treatment with inorganic compounds }                                      |
| C09C 1/3661 | .... | {Coating }   |

- C09C 1/3669 . . . {Treatment with low-molecular organic compounds }
- C09C 1/3676 . . . {Treatment with macro-molecular organic compounds }
- C09C 1/3684 . . . {Treatment with organo-silicon compounds }
- C09C 1/3692 . . {Combinations of treatments provided for in groups [C09C 1/3615](#) to [C09C 1/3684](#) }
  
- C09C 1/38 . Compounds of mercury { ([C09C 1/0009](#), [C09C 1/0015](#), [C09C 1/0078](#) take precedence) }
  
- C09C 1/40 . Compounds of aluminium { ([C09C 1/0009](#), [C09C 1/0015](#), [C09C 1/0078](#), [C09C 1/32](#) take precedence) }
- C09C 1/402 . . {Satin white, modifications thereof, e.g. carbonated or silicated; Calcium sulfoaluminates; Mixtures thereof, e.g. with calcium carbonate or kaolin }
- C09C 1/405 . . {containing combined silica, e.g. mica }
- C09C 1/407 . . {Aluminium oxides or hydroxides }
- C09C 1/42 . . Clays ([preparatory treatment for clay wares C04B 33/04](#))
  
- C09C 1/44 . Carbon
- C09C 1/46 . . Graphite ( {[C09C 1/0015](#) takes precedence } ; [preparation of graphite C01B 31/04](#))
- C09C 1/48 . . Carbon black
- C09C 1/482 . . . { [Preparation from used rubber products, e.g. tyres \(recovery of plastics or other constituents of waste material containing plastics B29B 17/00\)](#) }
- C09C 1/485 . . . {[Preparation involving the use of a plasma or of an electric arc](#) }
- C09C 1/487 . . . {[Separation; Recovery \(quenching C09C 1/50 to C09C 1/54\)](#) }
- C09C 1/50 . . . Furnace black; {[Preparation thereof \(separation or recovery C09C 1/487\)](#) }
- C09C 1/52 . . . Channel black; {[Preparation thereof \(separation or recovery C09C 1/487\)](#) }
- C09C 1/54 . . . Acetylene black; Thermal black; {[Preparation thereof \(separation or recovery C09C 1/487\)](#) }
- C09C 1/56 . . . Treatment of carbon black; {[Purification](#) }
- C09C 1/565 . . . . {[comprising an oxidative treatment with oxygen, ozone or oxygenated compounds, e.g. when such treatment occurs in a region of the furnace next to the carbon black generating reaction zone](#) }
- C09C 1/58 . . . . Agglomerating, pelleting, or the like by wet methods
- C09C 1/60 . . . . Agglomerating, pelleting, or the like by dry methods
  
- C09C 1/62 . Metallic pigments or fillers ( {[C09C 1/0015](#) takes precedence } ; [obtaining metal powder, see the relevant class for the method used, e.g. B22F 9/00, C21B 15/02, C22B 5/20, C25C 5/00](#))
- C09C 1/622 . . {[Comminution, shaping or abrasion of initially uncoated particles, possibly in presence of grinding aids, abrasives or chemical treating or coating agents; Particle solidification from melted or vaporised metal; Classification](#) }
- C09C 1/625 . . . {[the particles consisting of zinc or a zinc alloy](#) }
- C09C 1/627 . . {[Copper](#) }
- C09C 1/64 . . Aluminium
- C09C 1/642 . . . {[treated with inorganic compounds](#) }
- C09C 1/644 . . . {[treated with organic compounds, e.g. polymers](#) }
- C09C 1/646 . . . . {[concomitant with mechanical comminution, shaping or abrasion of the particles](#) }

C09C 1/648 . . . {treated with inorganic and organic, e.g. polymeric, compounds }

C09C 1/66 . Copper alloys, e.g. bronze

**C09C 3/00** **Treatment in general of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties (dyeing other macromolecular particles [C08J 3/20](#); dyeing macromolecular fibres [D06P](#) )**

C09C 3/003 . {Flushing }

C09C 3/006 . { Combinations of treatments provided for in groups [C09C 3/04](#) to [C09C 3/12](#) }

#### **NOTE**

When classifying in this group, it is desirable to classify the individual treatment steps with symbols chosen from groups [C09C 3/04](#) to [C09C 3/12](#).

C09C 3/04 . Physical treatment, e.g. grinding, treatment with ultrasonic vibrations { ([C09C 3/006](#) takes precedence) }

C09C 3/041 . . {Grinding }

C09C 3/043 . . {Drying, calcination }

C09C 3/045 . . {Agglomeration, granulation, pelleting }

C09C 3/046 . . {Densifying, degassing, packaging }

C09C 3/048 . . {Treatment with a plasma }

C09C 3/06 . Treatment with inorganic compounds { ([C09C 3/006](#), [C09C 3/048](#) take precedence) }

C09C 3/063 . . {Coating }

C09C 3/066 . . {Treatment or coating resulting in a free metal containing surface-region ([C09C 1/0078](#) takes precedence) }

C09C 3/08 . Treatment with low-molecular-weight {non-polymer } organic compounds { ([C09C 3/006](#), [C09C 3/048](#) take precedence) }

C09C 3/10 . Treatment with macromolecular organic compounds { ([C09C 3/006](#) takes precedence) }

C09C 3/12 . Treatment with organosilicon compounds { ([C09C 3/006](#) takes precedence) }

#### **Guidance heading:**

**C09C 2200/00** **Compositional and structural details of pigments exhibiting interference colours**

#### **NOTE**

When indexing codes [C09C 2200/00](#) to [C09C 2220/20](#) are used, no codes are given for the particle morphology according to the indexing codes [C01P 2004/10](#) to [C01P 2004/42](#) or [C01P 2004/80](#) to [C01P 2004/88](#)

C09C 2200/10 . Interference pigments characterized by the core material

- C09C 2200/1004 . . the core comprising at least one inorganic oxide, e.g. Al<sub>2</sub>O<sub>3</sub>, TiO<sub>2</sub> or SiO<sub>2</sub>
- C09C 2200/1008 . . . comprising at least one metal layer adjacent to the core material, e.g. core-M or M-core-M
- C09C 2200/1012 . . . . with a protective coating on the metal layer
- C09C 2200/1016 . . . comprising an intermediate layer between the core and a stack of coating layers having alternating refractive indices
- C09C 2200/102 . . the core consisting of glass or silicate material like mica or clays, e.g. kaolin
- C09C 2200/1025 . . . comprising at least one metal layer adjacent to core material, e.g. core-M or M-core-M
- C09C 2200/1029 . . . . with a protective coating on the metallic layer
- C09C 2200/1033 . . . comprising an intermediate layer between the core and a stack of coating layers having alternating refractive indices
- C09C 2200/1037 . . the core consisting of an inorganic suboxide or a mixture thereof, e.g. SiO<sub>x</sub> or TiO<sub>x</sub>
- C09C 2200/1041 . . . comprising at least one metal layer adjacent to core material, e.g. core-M or M-core-M
- C09C 2200/1045 . . . . with a protective coating on the metallic layer
- C09C 2200/105 . . . comprising an intermediate layer between the core and a stack of coating layers having alternating refractive indices
- C09C 2200/1054 . . the core consisting of a metal
- C09C 2200/1058 . . . comprising a protective coating on the metallic layer
- C09C 2200/1062 . . the core consisting of an organic compound, e.g. Liquid Crystal Polymers (LCP), Polymers or natural pearl essence
- C09C 2200/1066 . . . comprising at least one metal layer adjacent to the core material, e.g. core-M, M-core-M
- C09C 2200/107 . . . . with a protective coating on the metallic layer
- C09C 2200/1075 . . the core consisting of a mixture of inorganic and organic phases
- C09C 2200/1079 . . . comprising at least one metal layer adjacent to the core material, e.g. core-M or M-core-M
- C09C 2200/1083 . . . . with a protective coating on the metallic layer
- C09C 2200/1087 . . the core consisting of bismuth oxychloride, magnesium fluoride, nitrides, carbides, borides, lead carbonate, barium or calcium sulfate, zinc sulphide, molybdenum disulphide or graphite
- C09C 2200/1091 . . . comprising at least one metal layer adjacent to the core material, e.g. core-M or M-core-M
- C09C 2200/1095 . . . . comprising a protective coating on the metal layer
- C09C 2200/20 . . Interference pigments comprising a layer with a concentration gradient or a gradient of the refractive index
- C09C 2200/202 . . of sub-stoichiometric inorganic compounds
- C09C 2200/205 . . of coloured inorganic materials
- C09C 2200/207 . . of carbonaceous material, e.g. carbon black, graphite or SWNT
- C09C 2200/24 . . Interference pigments comprising a metallic reflector or absorber layer, which is not adjacent to the core
- C09C 2200/30 . . Interference pigments characterised by the thickness of the core or layers thereon or by the total thickness of the final pigment particle
- C09C 2200/301 . . Thickness of the core



- C09C 2200/302 . . Thickness of a layer with high refractive material
- C09C 2200/303 . . Thickness of a layer with low refractive material
- C09C 2200/304 . . Thickness of intermediate layers adjacent to the core, e.g. metallic layers, protective layers, rutilisation enhancing layers or reflective layers
- C09C 2200/305 . . Thickness of intermediate layers within the stack
- C09C 2200/306 . . Thickness of an absorbing layer
- C09C 2200/307 . . Thickness of an outermost protective layer
- C09C 2200/308 . . Total thickness of the pigment particle
  
- C09C 2200/40 . Interference pigments comprising an outermost surface coating
- C09C 2200/401 . . Inorganic protective coating
- C09C 2200/402 . . Organic protective coating
- C09C 2200/403 . . . Low molecular weight materials, e.g. fatty acids
- C09C 2200/404 . . . . comprising additional functional groups, e.g. -NH<sub>2</sub>, -C=C- or -SO<sub>3</sub>
- C09C 2200/405 . . . High molecular weight materials, e.g. polymers
- C09C 2200/406 . . . . comprising additional functional groups e.g. -NH<sub>2</sub>, -C=C- or -SO<sub>3</sub>
- C09C 2200/407 . . . Organosilicon materials, e.g. silanes, silicones
- C09C 2200/408 . . . . comprising additional functional groups, e.g. -NH<sub>2</sub>, -C=C- or -SO<sub>3</sub>
- C09C 2200/409 . . Mixed inorganic-organic coating
  
- C09C 2200/50 . Interference pigments comprising a layer or a core consisting of or comprising discrete particles, e.g. nanometric or submicrometer-sized particles
- C09C 2200/502 . . Metal particles
- C09C 2200/505 . . Inorganic particles, e.g. oxides, nitrides or carbides
- C09C 2200/507 . . Organic particles, e.g. polymers or dyes

#### Guidance heading:

#### **C09C 2210/00 Special effects or uses of interference pigments**

- C09C 2210/10 . Optical properties in the IR-range, e.g. camouflage pigments
- C09C 2210/20 . Optical properties in the UV-range
- C09C 2210/30 . A layer or the substrate forming a grating
- C09C 2210/40 . Embossed layers
- C09C 2210/50 . Fluorescent, luminescent or photoluminescent properties
- C09C 2210/60 . Interference with laser-light, laser markable pigments

#### **C09C 2220/00 Methods of preparing the interference pigments**

- C09C 2220/10 . Wet methods, e.g. co-precipitation



- [C09C 2220/103](#) . . comprising a drying or calcination step after applying each layer
- [C09C 2220/106](#) . . comprising only a drying or calcination step of the finally coated pigment
- [C09C 2220/20](#) . PVD, CVD methods or coating in a gas-phase using a fluidized bed