The present invention relates to a static conductive anticorrosive coating composition, comprising a base comprising an epoxy resin and conductive mica powder; and a hardener comprising an epoxy resin and an aromatic polyamine and/or a prepolymer produced by the reaction of an epoxy resin and an aromatic polyamine. The coating, when cured, may exhibit excellent static conductive and anticorrosive properties.
The present invention relates to a static conductive anticorrosive coating composition, comprising: (1) a base comprising an epoxy resin and conductive mica powder; and (2) a hardener comprising an epoxy resin and an aromatic polyamine and/or a prepolymer produced by the reaction of an epoxy resin and an aromatic polyamine.

Petrochemical industry plays an important irreplaceable role in modern life. With rapid development of China's petrochemical industry, security issues of oil production, transport and storage also become increasingly prominent, especially oil tank explosion caused by static electricity, burning, corrosion, leaks and oil pollution. Therefore, there is a need for oil tank static conductive coatings in the petrochemical industry. Such coatings typically should have good corrosion resistance, chemical resistance, sealing properties and/or mechanical strength, in addition to having static conductive properties.

Currently, most static conductive coatings comprise metal oxide conductive powder or, if black, comprise carbonaceous materials such as conductive graphite. The static conductive coatings comprising metal oxide conductive powder may have certain disadvantages, such as being easy to precipitate and/or poor conductivity, while the static conductive coatings comprising carbonaceous materials may also have certain additional disadvantages, such as being easy to agglomerate, being easy to crack, and/or poor oil resistance, causing electrochemical corrosion to the oil tank walls. Therefore, there is a need for improved oil tank static conductive coatings.

The present invention provides a static conductive anticorrosive coating composition comprising: (1) a base comprising an epoxy resin and conductive mica powder; and (2) a hardener comprising an epoxy resin and an aromatic polyamine and/or a prepolymer produced by the reaction of an epoxy resin and an aromatic polyamine. The present invention also provides a method to prepare the static
conductive anticorrosive coating composition.

DETAILED DESCRIPTION OF THE INVENTION

[005] The present invention provides a static conductive anticorrosive coating composition comprising: (1) a base comprising an epoxy resin and conductive mica powder; and (2) a hardener comprising an epoxy resin and an aromatic polyamine and/or a prepolymer produced by the reaction of an epoxy resin and an aromatic polyamine.

[006] The epoxy resin used in the base component of the static conductive anticorrosive coating composition may comprise a heat resistant resin with multi-functional groups. The epoxy resin can include but is not limited to one or more of phenolic epoxy resins, bisphenol A epoxy resin, and bisphenol F epoxy resin.

[007] In certain embodiments, the base component comprises one or more epoxy resins selected from bisphenol A liquid epoxy resin and bisphenol A solid epoxy resin. In one embodiment, the base component comprises both a bisphenol A liquid epoxy resin and a bisphenol A solid epoxy resin. The combination of both liquid and solid epoxy resins may help to achieve high solid content with good corrosion resistance. The bisphenol A liquid epoxy resin can have a relatively low average molecular weight with an average polymerization degree of n = 0 to 1.8. The specific examples include but are not limited to bisphenol A epoxy type E-55, E-51, E-44, E-42 and E-35 available from Nanyan Epoxy Resin (Kunshan) Co., ltd., Kukdo Chemical (Kunshan) Co., ltd., Shanghai Yoo-point Chemical, et.al. The bisphenol A liquid epoxy resin that may be used in the static conductive anticorrosive coating composition of the present invention can have a number average molecular weight of less than 700. The bisphenol A solid epoxy resin can have a relatively high average molecular weight with an average polymerization degree of n = 1.8 to 19. The specific examples include but are not limited to bisphenol A epoxy type E-20, E-12, E-06 and E-03 available from Nanyan Epoxy Resin (Kunshan) Co., ltd., Kukdo Chemical (Kunshan) Co., ltd., Shanghai Yoo-point Chemical, et.al. The bisphenol A solid epoxy resin used in the static conductive anticorrosive coating composition of the present invention can have a number average molecular weight within the range of 700 to 1100.

[008] In certain embodiments, based on the total weight of the base component, the bisphenol A liquid epoxy resin is present in an amount of 10 to 30 wt%, such as 14 to 28 wt%, or 16 to 22 wt%. The bisphenol A solid epoxy resin is present in an amount of 2 to
14 wt%, such as 4 to 12 %, or 6 to 10 wt%.

[009] The base component further comprises conductive mica powder. The coating composition may further comprise a second conductive powder, such as stainless steel powder, conductive titanium dioxide, conductive barium sulfate, copper powder, nickel powder, and/or aluminum powder.

[0010] In certain embodiments, based on the total weight of the base component, the conductive mica is present in an amount of 10 to 35 wt%, such as 15 to 30 wt%, or 20 to 25 wt%.

[0011] In certain embodiments, the base component further comprises optional ingredients. Typically, the base component will contain a diluent, such as water, or an organic solvent or a mixture of water and organic solvent to dissolve or disperse the resinous ingredients. The diluent may be reactive or unreactive or mixtures thereof. Examples of suitable organic solvents are aliphatic hydrocarbons such as mineral spirits and high flash point VM&P naphtha; aromatic hydrocarbons such as benzene, toluene, xylene and solvent naphtha 100, 150, 200 and the like; alcohols, for example, ethanol, n-propanol, isopropanol, n-butanol, isobutanol and the like; ketones such as acetone, cyclohexanone, methylisobutyl ketone and the like; esters such as ethyl acetate, butyl acetate, and the like; glycols such as butyl glycol, glycol ethers such as methoxypropanol and ethylene glycol monomethyl ether and ethylene glycol monobutyl ether and the like. Mixtures of various organic solvents can also be used. The diluent can include one or more of toluene, xylene, n-propanol, isopropanol, n-butanol and isobutanol, and in a particularly suitable embodiment includes one or more of xylene and isobutanol. When present, the diluent is used in the base component in amounts of 8 to 30 wt%, such as 10 to 28 wt%, 12 to 26 wt%, or 14 to 24 wt% based on total weight of the base component.

[0012] Another optional ingredient is a filler. The filler can include, for example, one or more of talc, barium sulfate, silica powder, kaolin, titanium dioxide, and molybdenum disulfide. In a particularly suitable embodiment, the filler comprises talc and quartz powder. When present, based on the total weight of the base component, the filler such as present in an amount of 5 to 35 wt%, such as 10 to 30 wt%, or 15 to 25 wt%.

[0013] Another optional ingredient is a pigment. The pigment may be conventional inorganic pigments in the art, including but not limited to iron oxide pigments, titanium dioxide pigments, zinc oxide pigments and the like. When present, based on the total weight of the base component, the pigment can be present in an amount of 1 to 15 wt%,
such as 3 to 13 wt%, or 5 to 11 wt%.

[0014] The base component of the static conductive anticorrosive coating composition of the present invention can also comprise any additives standard in the art of coating manufacture including preservatives such as non-leafing aluminum paste, nonylphenol, and the like; anti-sagging agents such as micronized wax; adhesion promoters such as organic silanes. Other additives include colorants, plasticizers, abrasion-resistant particles, film strengthening particles, flow control agents, thixotropic agents, rheology modifiers, catalysts, antioxidants, biocides, defoamers, surfactants, wetting agents, dispersing aids, adhesion promoters, clays, hindered amine light stabilizers, UV light absorbers and stabilizers, a stabilizing agent, fillers, grind vehicles, and other customary auxiliaries, or combinations thereof. "Colorants" and "abrasion resistant particles" are as defined in US Patent Publication No. 2011/0244156 - Paragraphs [0044] through [0054].

[0015] In certain embodiments, based on the total weight of the base component, the base component comprises 6 to 12 wt% of a preservative; 0.5 to 1.5 wt% of anti-sagging agent; and 0.2 to 0.4 wt% of adhesion promoter.

[0016] The epoxy resin comprised in the hardener component of the static conductive anticorrosive coating composition can be as described above for the base component. In particularly suitable embodiments, the epoxy used in the hardener comprises a bisphenol A liquid epoxy resin, also as described above.

[0017] In certain embodiments, based on the total weight of the hardener component, the bisphenol A liquid epoxy resin can be present in an amount of 20 to 40 wt%, such as 24 to 36 wt%, or 26 to 32 wt%.

[0018] The hardener component further comprises an aromatic polyamine. Any polyamine known in the art can be used, including but not limited to modified phenolic amines, aromatic amines, and the like. Particularly suitable aromatic amines include but are not limited to xylylenediamine, diaminodiphenyl methane, diethyl toluene diamine, m-xylylenediamine and the like.

[0019] In certain embodiments, based on the total weight of the hardener component, the polyamine is present in an amount of 10 to 30 wt%, such as 14 to 26 wt%, 16 to 24 wt%, or 18 to 22 wt%.

[0020] In certain embodiments, the epoxy and polyamine in the hardener component are in the form of a prepolymer produced by the reaction of an epoxy resin and an
aromatic polyamine. When mixing with the base component, the prepolymer may have better solubility in comparison with the unreacted epoxy and aromatic polyamine; this may lead to a more rapid cure and/or to a more stable coating layer that may have better static conductive properties and/or corrosion resistance.

In certain embodiments, the hardener component further comprises optional ingredients. For example, the hardener component can contain a diluent such as any of those described above. The diluent can include, for example, one or more of toluene, xylene, n-butanol, iso-butanol, methyl isobutyl ketone, glycol esters, and glycidyl esters. When present, the diluent can be used in the hardener component in amounts of 25 to 65 wt%, such as 30 to 60 wt%, 35 to 55 wt%, or 40 to 50 wt%.

Another optional ingredient is a reaction accelerator or promoter. Suitable reaction promoters include but are not limited to 2,4,6-tris(dimethylaminomethyl)phenol, salicylic acid, p-toluenesulfonic acid, benzoic acid, formic acid and lactic acid, and so on. When present, based on the total weight of the hardener component, the reaction promoter can be present in an amount of 2 to 10 wt%, such as 3 to 9 wt%, or 4 to 8 wt%.

In certain embodiments, based on its total weight, the static conductive anticorrosive coating composition of the present invention comprises the base component in an amount of 65 to 95 wt%, such as 70 to 90 wt%, 75 to 85 wt%, or 78 to 82 wt%, and the hardener component in an amount of 5 to 35 wt%, such as 10 to 30 wt%, 15 to 25 wt%, or 18 to 22 wt%.

The present invention also provides a method for preparing the static conductive anticorrosive coating composition of the present invention. The amounts of each ingredient in the following steps are defined as above. All amounts listed are described in parts by total weight, unless otherwise indicated. An embodiment of a particularly suitable method according to the present invention comprises preparation of a base component comprising: (1) homogenously mixing the epoxy resin with solvent in an amount of 20 to 30 wt% of the total amount of solvent used in the base component; and (2) while stirring, adding the conductive mica powder and remaining solvent, and then mixing at 1800 rpm for 5 mins.

In certain embodiments, optionally between step (1) and step (2), an anti-sagging agent can be slowly added into the homogeneous solution while stirring until totally dispersed or dissolved, and the maximum temperature does not exceed 35°C. Optionally, fillers and pigments are added while stirring, and the temperature can be kept
at 55 to 60°C for 15 minutes. Typically, the particles in the mixture will have a particle size of 70 to 80μm.

[0026] In certain embodiments, optionally after step (2), other ingredients including preservatives and adhesion promoters can be added while stirring, and mixed into a single substantially homogeneous phase.

[0027] The present methods further comprise preparation of a hardener component comprising: (1) homogenously mixing the aromatic polyamine with solvent in an amount of 20 to 30 wt% of the total amount of solvent used in the hardener component; and (2) while stirring, slowly adding the epoxy resin, and heating to 90 to 100°C for 60 mins.

[0028] In certain embodiments, optionally after step (2), a reactive diluent can be slowly added while stirring, and the temperature kept within the range of about 90 to 100°C. Optionally, other ingredients including reaction promoters are added while stirring to dissolve into a single substantially homogeneous phase.

[0029] The present invention also provides a method for applying the static conductive anticorrosive coating compositions of the present invention. Prior to being applied on substrates, the base component is mixed with the hardener component, wherein, based on the total weight of static conductive anticorrosive coating composition, the base component and the hardener component can each be present in amounts as described above. Following mixing, the mixed static conductive anticorrosive coating composition is applied to at least a portion of the substrate.

[0030] The static conductive anticorrosive coating composition of the present invention can be applied on a substrate known in the art, including equipment and facilities such as storage tanks, oil and gas pipelines, chemical plants. These substrates can be metallic. Metallic substrates include tin, steel, tin-plated steel, tin free steel, black plate, chromium passivated steel, galvanized steel, aluminum, aluminum foil and the like.

[0031] The static conductive anticorrosive coating composition of the present invention can be applied by any means standard in the art, such as electrocoating, spraying, electrostatic spraying, dipping, rolling, brushing, and the like.

[0032] After being applied to a substrate, the static conductive anticorrosive coating composition of the present invention can cure under ambient conditions, although elevated temperatures could also be used. By ambient conditions is meant that the coating
undergoes a thermosetting reaction without the aid of heat or other energy, for example, without baking in an oven, use of forced air, or the like. Typically, ambient conditions are 5 to 40°C, while temperatures greater than 40°C would be considered "elevated".

[0033] Notwithstanding that the numerical ranges and parameters setting forth the broad scope of the invention are approximations, the numerical values set forth in the specific examples are reported as precisely as possible. Any numerical value, however, inherently contains certain errors necessarily resulting from the standard variation found in their respective testing measurements.

[0034] As used herein, unless otherwise expressly specified, all numbers such as those expressing values, ranges, amounts or percentages may be read as if prefaced by the word "about", even if the term does not expressly appear. Plural encompasses singular and vice versa. For example, while the invention has been described in terms of "an" epoxy, "a" polymamine, "a" prepolymer and the like, mixtures of these and other components, can be used. Also, as used herein, the term "polymer" is meant to refer to prepolymer, oligomers and both homopolymers and copolymers; the prefix "poly" refers to two or more. When ranges are given, any endpoints of those ranges and/or numbers within those ranges can be combined with the scope of the present invention. "Including", "such as", "for example" and like terms means "including/such as/for example but not limited to".

[0035] The various embodiments and examples of the present invention as presented herein are each understood to be non-limiting with respect to the scope of the invention.

[0036] The invention will be further described by reference to the following examples. The following examples are merely illustrative of the invention and are not intended to be limiting.

EXAMPLES

[0037] The following examples are presented to demonstrate the general principles of the invention. The Examples describe the preparation of static conductive anticorrosive coating composition according to embodiments of the present invention and methods of preparation. All amounts listed are described in parts by total weight, unless otherwise indicated. The invention should not be construed as limited to the specific examples presented.

Example 1
Preparation of Static Conductive Anticorrosive Coating Composition

The static conductive anticorrosive coating composition of present invention was prepared in accordance with the following formulation:

| Base component | Resin | bisphenol A liquid epoxy resin | EP828 EL | 19 g |
|                | Conductive agent | conductive mica | LS-90 | 22 g |
|                | Filler | talc | Talc 325 mesh | 24 g |
|                | Solvent | xylene | 20 g |
|                | Pigment | titanium dioxide pigment | SR-237 | 7 g |

| Hardener component | Amine curing agent | m-xylenediamine | 5.9 g |
|                    | Resin | bisphenol A liquid epoxy resin | EP828 EL | 8.5 g |
|                    | Solvent | xylene | 9.8 g |
|                    | Solvent | isobutanol | 4.0 g |

Wherein, bisphenol A liquid epoxy resin purchased from Nanyan Epoxy Resin (Kunshan) Co., Ltd.;

bisphenol A solid epoxy resin purchased from Kukdo Chemical (Kunshan) Co., Ltd.;

conductive mica purchased from Shanghai Quanzhong Chemical Tech Co., Ltd.;
talc purchased from Shanghai Shuosi talc CO., LTD.
xylene purchased from Mitsubishi Chemical Holdings
titaniu m dioxide pigment purchased from Shandong Dongjia Group Co., Ltd.;
m-xylenediamine purchased from Mitsubishi Gas Chemical Co Inc.
isobutanol purchased from Dow chemical company

A. Preparation of base component

(1) 19 g of bisphenol A liquid epoxy resin were homogenously mixed with 8 g of bisphenol A solid epoxy resin in 5 g of xylene;

(2) 24 g of talc and 7 g of titanium dioxide pigment were added, with stirring, and stirring was continued at a temperature of 55 to 60 °C for 15 minutes, after which time the particles in the mixture had a particle size of 70 to 80 μm;

(3) 22 g of conductive mica powder and 15 g of xylene were then added with stirring, and mixing continued at 1800 rpm for 5 minutes to form a single homogeneous phase.

B. Preparation of hardener component

(1) 5.9 g of m-xylenediamine were mixed into a solvent mixture of 2.0 g of xylene and 1.0 g of isobutanol;
While stirring, 8.5 g of bisphenol A liquid epoxy resin in a solvent mixture of 7.8 g of xylene and 3.0 g of isobutanol were added and the mixture heated to 90 to 100 °C for 60 mins to form a single homogeneous phase.

Example 2
Preparation of Static Conductive Anticorrosive Coating Composition

The static conductive anticorrosive coating composition of present invention was prepared in accordance with the following formulation:

<table>
<thead>
<tr>
<th>Base component</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Resin</td>
<td>bisphenol A liquid epoxy resin</td>
<td>EP828 EL</td>
<td>20 g</td>
</tr>
<tr>
<td></td>
<td>bisphenol A solid epoxy resin</td>
<td>E1001 X 75</td>
<td>6 g</td>
</tr>
<tr>
<td>Conductive agent</td>
<td>conductive mica</td>
<td>LS-90</td>
<td>24 g</td>
</tr>
<tr>
<td>Filler</td>
<td>talc</td>
<td>Talc 325 mesh</td>
<td>20 g</td>
</tr>
<tr>
<td>Solvent</td>
<td>xylene</td>
<td></td>
<td>20 g</td>
</tr>
<tr>
<td>Pigment</td>
<td>titanium dioxide pigment</td>
<td>SR-237</td>
<td>10 g</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hardener component</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Amine curing agent</td>
<td>m-xylenediamine</td>
<td></td>
<td>5.6 g</td>
</tr>
<tr>
<td>Resin</td>
<td>bisphenol A liquid epoxy resin</td>
<td>EP828 EL</td>
<td>9.0 g</td>
</tr>
<tr>
<td>Solvent</td>
<td>xylene</td>
<td></td>
<td>9.5 g</td>
</tr>
<tr>
<td></td>
<td>isobutanol</td>
<td></td>
<td>4.0 g</td>
</tr>
</tbody>
</table>

Wherein, bisphenol A liquid epoxy resin purchased from Nanyan Epoxy Resin (Kunshan) Co., Ltd.;
bisphenol A solid epoxy resin purchased from Kukdo Chemical (Kunshan) Co., Ltd.;
conductive mica purchased from Shanghai Quanzhong Chemical Tech Co., Ltd.;
talc purchased from Shanghai Shuosi talc CO., LTD.
xylene purchased from Mitsubishi Chemical Holdings
titaminium dioxide pigment purchased from Shandong Dongjia Group Co., Ltd.;
m-xylenediamine purchased from Mitsubishi Gas Chemical Co Inc.
isobutanol purchased from Dow chemical company

A. Preparation of base component

(1) 20 g of bisphenol A liquid epoxy resin were homogenously mixed with 6 g of bisphenol A solid epoxy resin in 5g of xylene;

(2) While stirring, 20 g of talc and 10 g of titanium dioxide pigment were added and stirring continued at a temperature of 55 to 60 °C for 15 minutes, after which time the
particles in the mixture had a particle size of 70 to 80\(\mu\)m;

(3) While stirring, 24 g of conductive mica powder and 15 g of xylene were added, and mixing continued at 1800 rpm for 5 minutes to form a single homogeneous phase.

B. Preparation of hardener component

(1) 5.6 g of m-xylenediamine were homogenously mixed into a solvent mixture of 2.0 g of xylene and 1.0 g of isobutanol;

(2) While stirring, 9.0 g of bisphenol A liquid epoxy resin in a solvent mixture of 7.5 g of xylene and 3.0 g of isobutanol were added, and the mixture heated to 90 to 100°C for 60 mins to form a single homogeneous phase.

Example 3

Performance Tests for the Static Conductive Anticorrosive Coating Compositions

[0040] Test Method

A. Viscosity

[0041] The base and hardener were mixed, and the viscosity of the mixture was measured using a Huck viscometer at the temperature of 23°C.

B. Particle size

[0042] The base and hardener were mixed, and a small amount of the mixture was taken as a testing sample. A droplet of the sample was placed on a grind-o-meter (measuring range: 0-100 \(\mu\)m) at the position of 100\(\mu\)m. A special spatula was used to uniformly scrape the sample from top to bottom, then the scrapped sample was observed. The reading at which the particle aggregation was observed was recorded as the particle size of the coating mixture.

C. Resistance to sagging

[0043] A clean tinplate was tiled on an experiment table, and a sag meter with a measure range 100-1000\(\mu\)m was placed on the top side of the tinplate. The base and hardener were mixed, and the mixture was added into the sag meter, and then was uniformly scrapped from top to bottom. Then the tinplate was vertically placed with the thick end of the mixture film at downside for a few minutes. The mixture film was observed to see if any shedding occurred and the reading was recorded.

D. Conductivity

[0044] The base and hardener were mixed, applied on an iron plate with a dimension of 300 mm long, 150 mm wide and 1.5 mm thick, and then cured, wherein the iron plate had been treated with sand blasting (treatment leval Sa2.5). A
conductivity meter was directly placed on the cured coating, and the conductivity reading was recorded.

E. Potlife at 20°C

[0045] The base and hardener were mixed at 20°C, and an initial viscosity of the mixture was measured using a Huck viscometer. The viscosity of the mixture was continuously measured at an interval of 5 mins. When the viscosity become twice as the initial viscosity, the time was recorded as the potlife of the coating mixture at 20°C.

F. Sea water immersion

[0046] The base and hardener were mixed, applied on an iron plate with a dimension of 150 mm long, 75 mm wide and 1.5 mm thick, wherein the iron plate had been treated with sand blasting (treatment level Sa2.5), and then cured at room temperature for 14 days to assure the coating was completely dried. Then, a trace of 5 cm long and 1 mm wide was drawn in the middle of the iron plate, the trace was deep enough to expose the iron substrate, and then was placed into 3 wt% saline water. At least three identical iron plates was prepared and placed in 3 wt% saline water. Respectively, at least one iron plate was taken out at the time of 2 months, 4 months and 6 months for examination. When examined, the coating edge along the trace was picked up with a knife until the coating could not be separated from the iron substrate, then the width of the peeled-off coating was recorded. Meanwhile, the coating was observed to see if there was any surface rust or blistering.

G. Salt spray

[0047] The base and hardener were mixed, applied on an iron plate with a dimension of 150 mm long, 75 mm wide and 1.5 mm thick, wherein the iron plate had been treated with sand blasting (treatment level Sa2.5), and then cured at room temperature for 14 days to assure the coating was completely dried. Then, a trace of 5 cm long and 1 mm wide was drawn in the middle of the iron plate, the trace was deep enough to expose the iron substrate, and then was placed into a salt spray chamber with a salt spray concentration of 5 wt%. At least three identical iron plates were prepared and placed in the salt spray chamber. Respectively, at least one iron plate was taken out at the time of 1,000 hrs, 2,000 hrs, and 3,000 hrs for examination. When examined, the coating edge along the trace was picked up with a knife until the coating could not be separated from the iron substrate, then the width of the peeled-off coating was recorded. Meanwhile, the coating was observed to see if there was any surface rust or blistering.

H. Cathodic protection
[0048] The base and hardener were mixed, applied on an iron plate with a dimension of 150 mm long, 150 mm wide and 1.5 mm thick, wherein the iron plate had been treated with sand blasting (treatment level Sa2.5), and then cured at room temperature for 14 days to assure the coating was completely dried. Then, a trace of 5 cm long and 1 mm wide was drawn in the middle of the iron plate, the trace was deep enough to expose the iron substrate, and then was placed in a cathodic protection chamber. At least three identical iron plates were prepared and placed in the chamber. Respectively, at least one iron plate was taken out at the time of 4 months and 6 months for examination. When examined, the coating was observed to see if there was any surface rust or blistering.

[0049] Test Result

[0050] The base and hardener prepared in the aforesaid examples were respectively mixed, and were tested as described above, the results were as follows:

<table>
<thead>
<tr>
<th>Composition Example</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity (dpa/s)</td>
<td>14.75</td>
<td>16.88</td>
</tr>
<tr>
<td>Particle size (µm)</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Resistance to sagging (µm)</td>
<td>700</td>
<td>700</td>
</tr>
<tr>
<td>Conductivity (Ω·cm²)</td>
<td>10⁵</td>
<td>10⁷</td>
</tr>
<tr>
<td>potlife at 20°C (hr)</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Sea water immersion

<table>
<thead>
<tr>
<th>Exposure time</th>
<th>Composition Example</th>
<th>Rust</th>
<th>Blistering</th>
<th>Width of peeled-off coating/mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 month</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1.1</td>
</tr>
<tr>
<td>4 month</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2.3</td>
</tr>
<tr>
<td>6 month</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1.9</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2.8</td>
</tr>
</tbody>
</table>

Salt spray

<table>
<thead>
<tr>
<th>Exposure time</th>
<th>Composition Example</th>
<th>Rust</th>
<th>Blistering</th>
<th>Width of peeled-off coating/mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 hours</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2.1</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2.1</td>
</tr>
<tr>
<td>2000 hours</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2.7</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>3.6</td>
</tr>
<tr>
<td>3000 hours</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>4.1</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>4.4</td>
</tr>
</tbody>
</table>
The results demonstrated that the static conductive anticorrosive coating of the present invention achieves the desired performance requirements.

Whereas particular embodiments of this invention have been described above for purposes of illustration, it will be evident to those skilled in the art that numerous variations of the details of the present invention may be made without departing from the invention as defined in the appended claims. It is understood, therefore, that this invention is not limited to the particular embodiments disclosed, but it is intended to cover modifications that are within the spirit and scope of the invention, as defined by the appended claims.
CLAIMS

1. A static conductive anticorrosive coating composition, comprising: a base comprising an epoxy resin and conductive mica powder; and a hardener comprising an epoxy resin and an aromatic polyamine and/or a prepolymer produced by the reaction of an epoxy resin and an aromatic polyamine.

2. The static conductive anticorrosive coating composition according to claim 1, wherein the coating composition comprises 65 to 95 wt% of base, and 5 to 35 wt% of hardener based on the total weight of the coating composition.

3. The static conductive anticorrosive coating composition according to claim 1, wherein the base comprises one or more epoxy resins selected from bisphenol A liquid epoxy resin and bisphenol A solid epoxy resin.

4. The static conductive anticorrosive coating composition according to claim 3, wherein the bisphenol A liquid epoxy resin has a number average molecular weight of less than 700 and the bisphenol A solid epoxy resin has a number average molecular weight in the range of 700 ~ 1100.

5. The static conductive anticorrosive coating composition according to claim 3, wherein the base comprises 10 to 30 wt% of bisphenol A liquid epoxy resin, and 2 to 14 wt% of bisphenol A solid epoxy resin based on the total weight of the base.

6. The static conductive anticorrosive coating composition according to claim 3, wherein the base comprises 10 to 35 wt% of conductive mica powder.

7. The static conductive anticorrosive coating composition according to claim 1, wherein the epoxy resin and aromatic polyamine of the hardener react to produce an amine functional prepolymer.

8. The static conductive anticorrosive coating composition according to claim 7, wherein the epoxy resin comprises bisphenol A liquid epoxy resin.
9. The static conductive anticorrosive coating composition according to claim 7, wherein the epoxy resin has a number average molecular weight of less than 700.

10. The static conductive anticorrosive coating composition according to claim 7, wherein the hardener comprises 20 to 40 wt% of bisphenol A liquid epoxy resin, and 10 to 30 wt% of aromatic polyamine.

11. A method for preparing the static conductive anticorrosive coating composition according to claim 1, comprising

   (1) Preparation of the base comprising:
       mixing the epoxy resin with solvent;
       adding the conductive mica powder and solvent, and then mixing to obtain the base;

   (2) Preparation of the hardener comprising:
       mixing the aromatic polyamine with solvent;
       adding the epoxy resin, and heating to obtain the hardener.

12. A method for coating a substrate, comprising mixing the base and hardener of the static conductive anticorrosive coating composition according to claim 1 and applying the composition to at least a portion of the substrate.
## INTERNATIONAL SEARCH REPORT

**International application No.**  
PCT/CN2014/072517

### A. CLASSIFICATION OF SUBJECT MATTER

C09D 163/02(2006.01)i; C09D 157/02(2006.01)i; C09D 5/08(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

### B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: C09D 163/-, C09D 157/-, C09D 5/-

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, EPDOC, CNPAT, CNKI, CA: aromatic, polyamine, coating, epoxy, resin, amine, hardener, curing agent, static, conductive, mica, anticorrosive, bisphenol A, liquid, solid

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C.  

See patent family annex.

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Date of the actual completion of the international search: 30 April 2014  
Date of mailing of the international search report: 27 May 2014

**Name and mailing address of the ISA/**

STATE INTELLECTUAL PROPERTY OFFICE OF THE P.R.CHINA (ISA/CN)  
6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing  
100088 China

**Facsimile No.** (86-10)62019451  
**Authorized officer** ZHAO, Xiaodi

**Facsimile No.** (86-10)62019451  
**Telephone No.** (86-10)82246795

Form PCT/ISA/210 (second sheet) (July 2009)
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