

DURABLE EPOXY RESIN PAINT COMPOSITION

The present applicant has filed Japanese patent applications mentioned below:

- "STAINLESS STEEL-CONTAINING EPOXY RESIN PAINT" (Japanese
5 Patent Application No. 162872/84, Japanese Patent
Laid-open No. 42578/86);
"CONCRETE COATING METHOD" (Japanese Patent Application
No. 115414/85);
"ELECTRODE GRID" (Japanese Patent Application No.
10 277937/85);
"METHOD FOR FORMING CHEMICAL-RESISTANT FILMS" (Japanese
Patent Application No. 25974/86);
"ELECTRODE GRID" (Japanese Patent Application No.
79242/86);
15 "METHOD FOR FORMING ACID-RESISTANT FILMS" (Japanese
Patent Application No. 114683/86).

The present invention is related to those applications.

It has been found in accordance with the present
invention that an epoxy resin paint composition can be
20 provided which will endure e.g. for a long period of
time salt water, gasolines, ketones, crude oils, strong
acids, strong alkalies, or other chemicals, and/or be
suitable for use with foods.

A first aspect of the invention provides an epoxy
25 resin paint composition comprising: 0.5 to 10% of a
vinylidene chloride-based resin emulsion; and 50 to
99.5% of an epoxy resin paint.

A second aspect of the invention provides a sub-
strate, comprising a coat (e.g. a film) prepared from
30 an epoxy resin paint composition of the first aspect of
the invention.

A third aspect of the invention provides a method
of refining zinc, comprising utilising an electrode
grid that is a substrate of the second aspect of the
35 invention.

The present invention can be embodied in any suitable manner, e.g. as indicated by the subordinate claims included in the claims appended to this specification. Any suitable substrate can be provided with
5 coat(s) prepared from epoxy resin paint compositions of the invention, e.g. metal substrates comprising iron, steel, copper, or aluminium. Some examples of vinylidene chloride-based resin emulsions are Saran Latex R Type L 321 (a trademark of Asahi Chemical Industry Co.,
10 Ltd.). The vinylidene chloride-based resin emulsion may be mixed with an epoxy resin paint that is free from a curing agent. If the amount of the vinylidene chloride-based resin emulsion to be added exceeds 10%, the affinity between the vinylidene chloride-base resin
15 emulsion and the epoxy resin paint becomes poor, whereby desired effects cannot be attained. If the amount to be added is less than 0.5%, the effect on durability is not satisfactory. Some examples of amounts of vinylidene chloride-base resin emulsion to be added are 3 to
20 8%, 6 to 8%, or substantially 3%.

The epoxy resin paint may be clear. The epoxy resin paint may comprise additive(s), e.g. pigment(s). The epoxy resin paint may be a modified epoxy resin paint e.g. a tar-epoxy resin paint comprising 5 to 30%
25 of tar.

There may be 5 to 40%, e.g. substantially 5%, of the metal foil pieces. The metal foil pieces may have a specific surface area of 1000 cm²/g or more e.g. in the range 1000 to 9250 cm²/g. The metal foil pieces
30 may have any shapes, e.g. an oval or leaf-like foil piece. The metal foil pieces may have a thickness of not more than 3 μm, a width of not more than 100 μm, and a length of not more than 100 μm. If the specific surface area is less than 1000 cm²/g, metal foil pieces
35 may be present in a vehicle of the paint composition, but the foil pieces do not contribute to a substantial improvement in durability of the coat. If the specific

surface area is 1000 cm²/g or more, metal foil pieces may be present in stratumform state in a vehicle of the paint composition, whereby the foil pieces contribute to a substantial improvement in durability of the product coat. Epoxy resin paint free from a curing agent may be previously incorporated with metal foil pieces. Some examples of metal foil pieces are stainless steel foil pieces, and cupro-nickel foil pieces. The stainless steel may be SUS 316L or SUS 304. The cupro-nickel may comprise 70 to 90% of copper and 10 to 30% of nickel.

In a coat (e.g. film) obtained from an epoxy resin paint composition of the present invention, observation by an electron microscope or by irradiation with infrared rays shows that no particles of the vinylidene chloride-based resin are present. Thus, it may be considered that the vinylidene chloride-based resin and the epoxy resin either react with each other and/or are strongly bonded to each other.

In using an epoxy resin paint composition of the present invention, a curing agent of the epoxy resin paint may be added, followed by application of the composition in a customary manner. The epoxy resin paint composition may be diluted, e.g. ethylene glycol monomethyl ether may be used as a diluent or solvent.

The following Examples illustrate but do not limit the present invention. Curing agents are utilised when required.

EXAMPLE 1

A durable epoxy resin paint composition comprised 3% of a vinylidene chloride-based resin emulsion and 97% of an epoxy resin paint. A test water was prepared by the dissolution test method according to the tar-epoxy resin paint application method for JWWA K-115 tap water. The water was tap water.

Test results are shown in Table 1. Table 1 indicates that the durable epoxy resin paint composition can meet water conditioning requirements as stipulated in the City Water Law (see Ordinance No. 56 of the Japanese Health and Welfare Office, 1978), and is suitable for the use with foods.

TABLE 1

Examination Item	Test Water	Blank (Tap Water)	Standard Value
Nitric nitrogen and nitrous nitrogen	0.9 mg/l	0.9 mg/l	≤ 10 mg/l
Chlorine ion	22.7 mg/l	22.7 mg/l	≤ 200 mg/l
Amount of Potassium permanganate consumed	1.6 mg/l	0.9 mg/l	≤ 10 mg/l
General bacteria	≤ 100 /ml	≤ 100 /ml	≤ 100 /ml
Colony bacilli group	not detected	not detected	to be not detected
Cyan ion	not detected	not detected	to be not detected (≤ 0.01 mg/l)
Mercury	not detected	not detected	to be not detected (≤ 0.0005 mg/l)
Organophosphorus	not detected	not detected	to be not detected (≤ 0.1 mg/l)
Copper	≤ 0.01 mg/l	≤ 0.01 mg/l	≤ 1.0 mg/l
Iron	≤ 0.05 mg/l	≤ 0.05 mg/l	≤ 0.3 mg/l
Manganese	≤ 0.01 mg/l	≤ 0.01 mg/l	≤ 0.3 mg/l
Zinc	0.02 mg/l	0.01 mg/l	≤ 1.0 mg/l
Lead	≤ 0.01 mg/l	≤ 0.01 mg/l	≤ 0.1 mg/l
Hexavalent chromium	≤ 0.02 mg/l	≤ 0.02 mg/l	≤ 0.05 mg/l
Cadmium	≤ 0.005 mg/l	≤ 0.005 mg/l	≤ 0.01 mg/l
Arsenic	≤ 0.0005 mg/l	≤ 0.005 mg/l	≤ 0.05 mg/l

TABLE 1 (Cont'd)

Examination Item	Test Water	Blank (Tap Water)	Standard Value
Fluorine	<0.15 mg/l	≤0.15 mg/l	≤0.8 mg/l
Hardness	61 mg/l	61 mg/l	≤ 300 mg/l
Evaporation residue	144 mg/l	141 mg/l	≤ 500 mg/l
Phenols	≤0.005 mg/l	≤0.005 mg/l	≤ 0.005 mg/l as phenol
Anionic surfactant	<0.2 mg/l	≤0.2 mg/l	≤0.5 mg/l
pH value	pH 7.1	pH 7.1	5.8 - 8.6
Residual chlorine	-	-	-
Odor	normal	normal	to be not abnormal
Taste	normal	normal	to be not abnormal
Chromaticity	1°	1°	<5°
Turbidity	1°	1°	<2°

EXAMPLE 2

As a substrate, a hot coil-made iron plate of black skin or calendered steel plate was used. After degreasing the surface of the plate, a stainless steel-
5 containing epoxy resin paint was applied thereonto to form an undercoat. On the undercoat, there was applied an overcoat of a durable epoxy resin paint composition comprising 3% of a vinylidene chloride-based resin emulsion and 97% of an epoxy resin paint.

10 The overcoat surface was subjected to a cross-cut test. As a result, the overcoat surface was found to be good as 100/100. When the overcoat surface was boiled in tap water for one hour, the surface was slightly coloured white, but the surface was found not
15 abnormal. When the cross-cut test was carried out after boiling, the surface was found to be good as 50/100. When the overcoat surface was immersed in methyl ethyl ketone (purity: 99% or more) for 25 days or longer, the surface was found not abnormal. The
20 same was also observed when the surface was immersed in gasoline for 60 days or longer, and or in crude oil for 6 months or longer.

EXAMPLE 3

On the exterior of an aluminium-made electrode
25 grid, a commercially available, epoxy resin paint was applied in a customary manner to give an undercoat. A durable epoxy resin paint composition was overcoated onto the undercoat. The paint composition comprised 3% of a vinylidene chloride-based emulsion and 97% of an
30 epoxy resin paint. One application thereof may be sufficient, but durability is improved with repeated applications of the paint composition. The epoxy resin paint may be clear, but may contain pigment(s) or other additive(s).

35 The durable epoxy resin composition is more durable

to electrolyte liquors of high temperature as the amount of vinylidene chloride-based resin emulsion is increased. For example, if said amount is 3%, the paint composition can endure a temperature of about 50°C, but the durability of the paint composition to a temperature of about 70°C is not sufficient unless said amount is adjusted to 6 to 8%. If said amount exceeds 10%, the affinity between vinylidene chloride-based resin emulsion and epoxy resin paint is poor. If said amount is less than 0.5%, the effect which can be brought by the addition of vinylidene chloride-based resin emulsion is not sufficiently attained.

The addition of vinylidene chloride-based resin emulsion may be considered as effective for preventing damage by acids and improving expansion durability relative to action of temperature. By the addition of vinylidene chloride-based resin emulsion, the amount of expansion of the electrode grid by the action of temperature becomes approximately equal to the amount of expansion of the applied coating portion by the action of the temperature, whereby the adhesion can be kept without causing peeling.

Using an aluminium-made electrode grid prepared by one application of the undercoat on the exterior of the original grid, and five applications of overcoats (film thickness: 600 µm) as described above, refining of zinc was carried out under conditions that sulfuric acid concentration is 15% and the electrolyte liquor temperature is at result. It was found that the life time of the coated grid is longer as compared with when a conventional polyvinyl chloride sheet was adhered to the original grid.

EXAMPLE 4

On the exterior of an aluminium-made electrode grid, a tar-epoxy resin paint containing about 25% of tar was applied to give an undercoat. A durable epoxy

resin paint composition comprising 3% of a vinylidene chloride-based resin emulsion and 97% of a tar-epoxy resin paint was overcoated onto the undercoat.

Using an aluminium-made electrode grid prepared by one application of the undercoat on the exterior of the original electrode grid, and five applications of overcoats (film thickness: 600 μm) as described above, refining of zinc was carried out under conditions that sulfuric acid concentration is 15% and the electrolyte liquor temperature is at about 45°C, with an electric current of 20 kA. It was found that the life time of the coated grid is longer as compared with when a conventional polyvinyl chloride sheet was adhered to the original grid.

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EXAMPLE 5

Iron or steel plates, copper plates, and aluminium plates were degreased and dressed. A tar-epoxy resin paint (containing about 10% of tar) was applied to give an undercoat on each plate. The tar-epoxy resin paint was a mixture of approximately equal amounts of a commercially available tar-epoxy resin paint (containing about 25% of tar) and a commercially available epoxy resin paint. The application of the tar-epoxy resin paint was carried out after adding thereto a curing agent in a known manner.

On the surface of the undercoat, there was overcoated a durable epoxy resin paint composition comprising 3% of a vinylidene chloride-based resin emulsion and 97% of an epoxy resin paint. The application was carried out after adding to the composition a curing agent in a known manner.

A test specimen was prepared by one application of the undercoat and one application of the overcoat, respectively. The test specimen was immersed in boiled 12% hydrochloric acid and, with the lapse of a pre-

determined period of time, was evaluated with respect to properties of the overcoat, e.g. occurrence of peeling. The overcoat was evaluated with respect to hardness by cutting with a cutter knife, and with
5 respect to adhesion by a cross-cut test.

Iron or Steel Plate:

The overcoat was durable to immersion for 150 minutes and tough in terms of hardness. The results of the cross-cut test showed that the overcoat was ex-
10 tremely good in adhesion as 100/100.

Copper Plate:

The overcoat was durable to immersion for 180 minutes, and tough in terms of hardness. The results of the cross-cut test showed that the overcoat was
15 extremely good in adhesion as 100/100. When a tar-epoxy resin paint (containing about 25% of tar) was used as undercoat, the overcoat was durable to immersion for 180 minutes and tough in terms of hardness. The results of the cross-cut test showed that the overcoat was
20 extremely good in adhesion as 100/100.

Aluminium Plate:

The overcoat was durable to immersion for 180 minutes, and tough in terms of hardness. The results of the cross-cut test showed that the overcoat was
25 extremely good in adhesion as 100/100.

EXAMPLE 6

A durable epoxy resin paint composition comprised 3% of a vinylidene chloride-based resin emulsion and 97% of an epoxy resin paint.

30 An immersion test was carried out under conditions that sodium hydroxide concentration is 20% and temperature is 50°C. The test showed no change of the overcoat occurred for 40 days. An immersion test was carried out under the conditions that sulfuric acid

concentration is 20% and temperature is 50°C. The test showed occurrence of partial blister of the overcoat after 40 days. These tests showed that the paint composition was superior to conventional paints.

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EXAMPLE 7

A soft steel plate having a width of 70 mm and a length of 150 mm was conditioned with a ketone. A commercially available epoxy zinc rich paint was applied as an undercoat on the conditioned plate. An overcoat of a durable epoxy resin paint composition (see below) was applied, to prepare a test specimen. The test specimen was tested for 500 hours by spraying with salt water having a concentration of 5%. The film thickness of the overcoat was measured by a micrometer and the thickness's average value was obtained. A primary adhesion test value is a value measured by an adhesion tester before the test. A secondary adhesion test value is a value measured by an adhesion tester after the spraying test for 500 hours.

20 Durable epoxy resin paint compositions comprised 3% of a vinylidene chloride-based resin emulsion, 82% of an epoxy resin paint, and 15% of metal foil pieces (see below).

25 An example of metal foil pieces having a specific surface area of 3800 cm²/g was made of stainless steel SUS 304. The overcoat surface was found good, having a film thickness of 160 μm, a primary adhesion test value of 28 kg/cm², and a secondary adhesion test value of 1 kg/cm².

30 An example of metal foil pieces having a specific surface area of 5750 cm²/g was made of stainless steel SUS 304. The overcoat surface was found good, having a film thickness of 160 μm, a primary adhesion test value of 25 kg/cm², and a secondary adhesion test value of from 1 to 2 kg/cm².

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An example of metal foil pieces having a specific surface area of from 3000 to 3500 cm²/g was made of stainless steel SUS 316L. The overcoat surface was found good, having a film thickness of 180 μm, a
5 primary adhesion test value of 28 kg/cm², and a secondary adhesion test value of from 1 to 4 kg/cm².

An example of metal foil pieces having a specific surface area of 3140 cm²/g was made of cupro-nickel. The overcoat surface was found good, having a film
10 thickness of 130 μm, a primary adhesion test value of 30 kg/cm², and a secondary adhesion test value of 3 kg/cm².

An example of metal foil pieces having a specific surface area of 9250 cm²/g was made of cupro-nickel.
15 The overcoat applied surface was found good, having a film thickness of 130 μm, a primary adhesion test value of 20 kg/cm², and a secondary adhesion test value of from 7 to 13 kg/cm².

However, when a paint composition was prepared by
20 adding metal foil pieces of stainless steel SUS 316L (having a specific surface area of from 3000 to 3500 cm²/g) to an epoxy resin paint without adding a vinylidene chloride-based resin emulsion, there was obtained an overcoat having a film thickness of 180 μm, a primary
25 adhesion test value of 28 kg/cm², and a secondary adhesion test value of from 1 to 4 kg/cm². This overcoat was observed to have generated a number of blisters thereon, and was inferior in quality to the foregoing overcoats (according to the present invention).

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EXAMPLE 8

As a substrate, a hot coil-made iron plate of black skin or of calendered steel plate was used. After degreasing the surface of the substrate plate, a stainless steel-containing epoxy resin paint was applied
35 to form an undercoat. On the undercoat, an overcoat was applied of a durable epoxy resin paint composition

comprising 3% of a vinylidene chloride-based resin emulsion and 15% of stainless steel metal foil pieces.

5 The overcoat surface was subjected to a cross-cut test. As a result, the surface was found to be good as 100/100. When the overcoat surface was boiled in tap water for one hour, the surface was not substantially abnormal. When the cross-cut test was carried out after boiling, the overcoat surface was found to be good as 50/100. When the overcoat surface was immersed
10 in methyl ethyl ketone (purity: 99% or more) for 25 days or longer, the surface was not found to be abnormal. The same was also observed when the surface was immersed in gasoline for 60 days or longer, or in crude oil for 6 months or longer, respectively.

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EXAMPLE 9

A durable epoxy resin paint comprising 3% of a vinylidene chloride-based resin emulsion and 15% of stainless steel metal foil pieces was used. A test water was prepared in a dissolution test method according to the tar-epoxy resin paint application method
20 for JWWA K-115 tap water. The water was tap water.

The results are shown in Table 2. Table 2 indicates that the durable epoxy resin paint composition can meet the water conditioning requirements as stipulated in the City Water Law (see Ordinance No. 56 of
25 the Health and Welfare Office, 1978), and is suitable for the use with foods.

TABLE 2

Examination Item	Test Water	Blank (Tap Water)	Standard Value
Nitric nitrogen and nitrous nitrogen	0.9 mg/l	0.9 mg/l	< 10 mg/l
Chlorine ion	22.7 mg/l	22.7 mg/l	≤ 200 mg/l
Amount of Potassium permanganate consumed	1.6 mg/l	0.9 mg/l	≤ 10 mg/l
General bacteria	≤ 100/ml	≤ 100/ml	≤ 100/ml
Colony bacilli group	not detected	not detected	to be not detected
Cyan ion	not detected	not detected	to be not detected (≤ 0.01 mg/l)
Mercury	not detected	not detected	to be not detected (≤ 0.0005 mg/l)
Organophosphorus	not detected	not detected	to be not detected (≤ 0.1 mg/l)
Copper	≤ 0.01 mg/l	≤ 0.01 mg/l	≤ 1.0 mg/l
Iron	≤ 0.05 mg/l	≤ 0.05 mg/l	≤ 0.3 mg/l
Manganese	≤ 0.01 mg/l	≤ 0.01 mg/l	≤ 0.3 mg/l
Zinc	0.02 mg/l	0.01 mg/l	≤ 1.0 mg/l
Lead	≤ 0.01 mg/l	≤ 0.01 mg/l	≤ 0.1 mg/l
Hexavalent chromium	≤ 0.02 mg/l	≤ 0.02 mg/l	≤ 0.05 mg/l
Cadmium	≤ 0.005 mg/l	≤ 0.005 mg/l	≤ 0.01 mg/l
Arsenic	≤ 0.0005 mg/l	≤ 0.005 mg/l	≤ 0.05 mg/l

TABLE 2 (Cont'd)

Examination Item	Test Water	Blank (Tap Water)	Standard Value
Fluorine	≤ 0.15 mg/l	≤ 0.15 mg/l	≤ 0.8 mg/l
Hardness	63 mg/l	61 mg/l	≤ 300 mg/l
Evaporation residue	143 mg/l	141 mg/l	≤ 500 mg/l
Phenols	≤ 0.005 mg/l	≤ 0.005 mg/l	≤ 0.005 mg/l as phenol
Anionic surfactant	≤ 0.2 mg/l	≤ 0.2 mg/l	≤ 0.5 mg/l
pH value	pH 7.1	pH 7.1	5.8 - 8.6
Residual chlorine	-	-	-
Odor	normal	normal	to be not abnormal
Taste	normal	normal	to be not abnormal
Chromaticity	1°	1°	$\leq 5^\circ$
Turbidity	1°	1°	$\leq 2^\circ$

EXAMPLE 10

A durable epoxy resin paint composition comprising 3% of a vinylidene chloride-based resin emulsion and 15% of stainless steel metal foil pieces was used.

5 An immersion test under the conditions that sodium hydroxide concentration is 20% and temperature is at 50°C confirmed that no change occurred for 40 days. An immersion test under conditions that sulfuric acid concentration is 20% and temperature is at 50°C showed
10 occurrence of partial blister after 40 days. These results reveal that the paint composition of the present invention was superior to conventional paints.

EXAMPLE 11

On a degreased and dressed copper plate, a durable
15 epoxy resin paint composition was applied as a coat. The paint composition comprised 3% of a vinylidene chloride-based resin emulsion, 82% of tar-epoxy resin paint containing about 25% of tar, and 15% of stainless steel metal foil pieces. The application was applied
20 twice by a brush, to prepare a test specimen.

The coat was subjected to a cross-cut test. The coat was found to be good as 100/100. When the coat surface was boiled in tap water for one hour, the surface of the coat was slightly faded in colour but
25 otherwise did not appear changed. When the cross-cut test was carried out after boiling, the coat surface was found to be good as 100/100. When the coat was immersed in methyl ethyl ketone (purity: 99% or more) for 25 days or longer, the coat was not found to be
30 abnormal. The same was also observed when the coat was immersed in gasoline for 60 days or longer, or in crude oil for 6 months or longer.

Comment

It is evident from the foregoing results that
35 durable epoxy resin paint compositions according to the

present invention can have the following effects:

(1) Paint compositions can meet water conditioning requirements as stipulated in the City Water Law (see Ordinance No. 56 of the Japanese Health and Welfare Office, 1978), and be suitable for the use with foods;

(2) Paint compositions can provide an applied surface or coating that endures salt water, gasolines, ketones, or crude oils for a long period of time;

(3) Paint compositions can provide on substrate surfaces (e.g. iron, copper, aluminium, or stainless steel) an applied surface or coating that endures strong acids (e.g. sulfuric acid or hydrochloric acid), strong alkalies (e.g. sodium hydroxide), or other chemicals for a long period of time; and

(4) Paint compositions when applied onto an electrode grid, can enable the grid to have a long life time, and provide good results as compared with conventional polyvinyl chloride sheet to the original grid.

The present invention includes changes, equivalents, or modifications within the scope of the appended claims.



Claims

1. An epoxy resin paint composition comprising: 0.5 to 10% of a vinylidene chloride-based resin emulsion; and 50 to 99.5% of an epoxy resin paint.
- 5 2. A composition as claimed in claim 1, wherein there is 3 to 8% of the vinylidene chloride-based resin.
3. A composition as claimed in claim 2, wherein there is 6 to 8% of the vinylidene chloride-based resin.
4. A composition as claimed in claim 2, wherein there is substantially 3% of the vinylidene chloride based resin.
- 10 5. A composition as claimed in any one of claims 1 to 4, wherein the epoxy resin paint is a modified epoxy resin paint.
- 15 6. A composition as claimed in claim 5, wherein the modified epoxy resin paint is a tar-epoxy resin paint.
7. A composition as claimed in claim 6, wherein the tar-epoxy resin paint comprises 5 to 30% of tar.
8. A composition as claimed in any one of claims 1 to 7, wherein there is 90 to 99.5% of the epoxy resin paint.
- 20 9. A composition as claimed in claim 8, wherein there is substantially 97% of the epoxy resin paint.
10. A composition as claimed in any one of claims 1 to 7, wherein there is 50 to 95% of the epoxy resin paint.
- 25 11. A composition as claimed in claim 10, wherein there is substantially 82% of the epoxy resin paint.
12. A composition as claimed in any one of claims 1 to 11, comprising metal foil pieces.
- 30 13. A composition as claimed in claim 12, wherein there is 5 to 40% of the metal foil pieces.



14. A composition as claimed in claim 13, wherein there is substantially 15% of the metal foil pieces.
15. A composition as claimed in any one of claims 12 to 14, wherein the metal foil pieces have a specific surface area of 1000 cm²/g or more.
16. A composition as claimed in claim 15, wherein the metal foil pieces have a specific area in the range 1000 to 9250 cm²/g.
17. A composition as claimed in any one of claims 12 to 16, wherein the metal foil pieces have a thickness of not more than 3 μm, a width of not more than 100 μm, and a length of not more than 100 μm.
18. A composition as claimed in any one of claims 12 to 17, wherein the metal foil pieces comprise stainless steel.
19. A composition as claimed in any one of claims 12 to 17, wherein the metal foil pieces comprise cupro-nickel.
20. A composition as claimed in claim 1, substantially as described in the Examples.
21. A substrate, comprising a coat prepared from a composition as claimed in any one of claims 1 to 20.
22. A substrate as claimed in claim 21, wherein the substrate comprises iron, steel, copper, or aluminium.
23. A substrate as claimed in claim 21, wherein the substrate is an aluminium-made electrode grid.
24. A method of refining zinc, comprising utilising an electrode grid that is a substrate as claimed in claim 23.
25. A durable epoxy resin paint composition comprising: from 0.5 to 10% of a vinylidene chloride-based resin emulsion; and from 99.5 to 90% of an epoxy resin paint.



26. A durable epoxy resin paint composition comprising:
from 5 to 40% of metal foil pieces having a specific
surface area of 1000 cm²/g or more; from 0.5 to 10%
of a vinylidene chloride-based resin emulsion; and
5 from 95 to 50% of an epoxy resin pain.
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