

DESCRIPTION

TITLE OF THE INVENTION: COATING MATERIAL, COATING MATERIAL LAYER, AND LAMINATED STRUCTURE

5 TECHNICAL FIELD

[0001]

The invention relates to a novel coating material, a novel coating material layer, and a novel laminate (coating) structure. The invention is generally applicable to buildings,
10 civil engineering structures, and other structures.

BACKGROUND ART

[0002]

Natural stones have been frequently used as surface
15 decorative materials on walls and other parts of buildings and civil engineering structures. Such materials can create aesthetics with a sense of depth, characteristics of natural materials. However, natural stones have disadvantages such as high cost, intractableness, and heavy weight. In particular,
20 intractableness and heavy weight may have an adverse effect on workability and safety during application to wall surfaces and other structures.

[0003]

Under these circumstances, a variety of techniques for
25 creating natural stone-like finishes with paint are recently

proposed. For example, JP-A-11-130980 (Patent Document 1) describes a composition containing aggregates with a particle size of 0.05 to 5 mm and an emulsion of acrylic resin containing silicon atoms in the resin skeleton. JP-A-2000-15999 (Patent Document 2) describes a paint material in which colored aggregates having a uniform particle size in the range of 10 to 1,000 μm is mixed and dispersed with a colorless transparent binder. However, these paint materials, which are composed mainly of aggregates, have a relatively high specific gravity. In addition, these paint materials need a relatively large amount to be applied and thus have limitations in forming lighter-weight structures.

[0004]

On the other hand, JP-A-05-237444 (Patent Document 3) and JP-A-2005-238138 (Patent Document 4) disclose methods of forming natural stone-like patterns by spray coating of two or more pigmented coating materials having difference colors. As compared with the techniques of Patent Documents 1 and 2, such methods are advantageous in forming lighter-weight structures.

[0005]

However, the methods of Patent Documents 3 and 4 need a plurality of coating materials, which makes coating operation complicated and also makes it difficult to reproduce the desired pattern. In addition, patterns formed by these methods tend to give an artificial impression and are less likely to give

a sense of depth characteristic of natural stones. In addition, exposure to sunlight or the like can increase the temperature of the patterned surfaces obtained by these methods.

5 PRIOR ART DOCUMENTS

PATENT DOCUMENTS

[0006]

Patent Document 1: JP-A-11-130980

Patent Document 2: JP-A-2000-15999

10 Patent Document 3: JP-A-05-237444

Patent Document 4: JP-A-2005-238138

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

15 [0007]

It is an object of the invention, which has been made in view of the above problems, to provide a coating material that is capable of creating transparency, a sense of depth, and other appearance features and also advantageous in lightness and convenience, and to provide a laminate (coating) structure that
20 has a high level of aesthetic properties such as transparency and a sense of depth and is also advantageous in lightness, suppressing temperature rise, and other effects.

25 MEANS FOR SOLVING THE PROBLEMS

[0008]

As a result of earnest study to solve the problems, the inventors have completed the invention by developing the coating material, the coating material layer, and the laminate
5 (coating) structure described below.

[0009]

The invention is directed to a coating material including two or more types of coloring granules having different colors, wherein at least one type of the coloring granules are
10 transparent coloring granules containing a water-borne resin and chromatic color particles and/or black particles, the transparent coloring granules are a granulated transparent colorant, and the transparent colorant is capable of forming a transparent colored coating with a contrast ratio of 80% or
15 less. The coating material can form a coating having transparency, a sense of depth, and other aesthetic properties. The coating material is relatively lightweight and makes it possible to form such a fine and beautiful coating with a single material. The use of the coating material also makes it
20 possible to create a natural stone-like aesthetic as if various natural stones are used. In this regard, the coating material is also useful.

[0010]

In the coating material of the invention, at least one
25 type of the coloring granules are preferably transparent

coloring granules further containing achromatic color particles (exclusive of black particles) with an average particle size of 0.4 μm or more and a refractive index of 1.4 to 2.0. This coating material can form a coating with a higher level of transparency, a sense of depth, and other appearance features, and is also effective in improving physical properties such as drying property, adhesion, water resistance, temperature rise-suppressing ability, non-adherence, fire resistance, and strength.

10 [0011]

In the coating material of the invention, the two or more types of coloring granules having different colors are preferably dispersed in an aqueous medium. This coating material is advantageous in safe and efficient coating and so on.

[0012]

The coating material layer of the invention is preferably made from the coating material. The coating material layer has transparency, a sense of depth, and other aesthetic properties. The coating material layer is also advantageous in that it is relatively lightweight and can create a natural stone-like aesthetic as if various natural stones are used.

[0013]

The laminate (coating) structure of the invention preferably includes a colored undercoating material layer and

the coating material layer provided on the colored undercoating material layer. This laminate structure is advantageous in improving transparency, a sense of depth, and other aesthetic properties.

5 [0014]

In the laminate (coating) structure of the invention, the colored undercoating material layer preferably has infrared reflecting properties. This laminate structure is advantageous in suppressing temperature rise caused by sunlight
10 or the like.

[0015]

In the laminate (coating) structure of the invention, at least one type of transparent coloring granules in the coating material layer preferably have the same color as that of the
15 colored undercoating material layer. This laminate structure is advantageous in improving transparency, a sense of depth, and other aesthetic properties, and also in producing a pattern-enlarging aesthetic effect.

[0016]

20 In the laminate (coating) structure of the invention, the coating material layer preferably has a dry thickness of 50 to 2,000 μm at its bump part. This laminate structure is advantageous in producing a sufficient level of aesthetic effect with respect to transparency, a sense of depth, and other
25 appearance features even when the coating material layer is

relatively thick.

[0017]

More specifically, the invention to solve the problems may have first, second, and third aspects, which will be
5 separately described in detail.

[0018]

(First Aspect of the Invention)

As a result of earnest study to solve the problems, the inventors have completed the invention by developing a coating
10 material including a dispersion of specific coloring granules in an aqueous medium.

[0019]

Specifically, the invention has the following features.

1. A coating material including a dispersion of two or more
15 types of coloring granules with different colors in an aqueous medium, wherein at least one type of the coloring granules are a granulated transparent colorant, and the transparent colorant contains a water-borne resin and chromatic color particles and/or black particles and is capable of forming a coating with
20 a contrast ratio of 80% or less.

2. The coating material according to item 1, wherein the transparent colorant further contains achromatic color particles (exclusive of black particles) with an average particle size of 0.4 μm or more and a refractive index of 1.4
25 to 2.0.

3. The coating material according to item 1 or 2, wherein the aqueous medium contains a water-borne resin.
4. The coating material according to any one of items 1 to 3, wherein the transparent colorant and/or the aqueous medium further contains a hydrophobic solvent.
5. The coating material according to item 4, wherein the hydrophobic solvent has a solubility in water of 5 g/100 g or less.
6. A coating method including applying a colored undercoating material to a base material and then applying the coating material according to any one of items 1 to 5.
7. A coating (laminate) structure including a base material, a colored undercoating material layer provided on the base material, and a coating material layer provided thereon, wherein the coating material layer contains two or more types of coloring granules having different colors, and at least one type of the coloring granules are transparent coloring granules containing a water-borne resin, and chromatic color particles and/or black particles.
8. The coating (laminate) structure according to item 7, wherein the transparent colorant further contains achromatic color particles (exclusive of black particles) with an average particle size of 0.4 μm or more and a refractive index of 1.4 to 2.0.
- [0020]

(Second Aspect of the Invention)

As a result of earnest study to solve the problems, the inventors have also completed the invention by developing a coating (laminate) structure including a base material, a colored undercoating material layer provided on the base material, and a specific coating material layer provided thereon.

[0021]

Specifically, the invention has the following features.

1. A coating (laminate) structure including a base material, a colored undercoating material layer provided on the base material, and a coating material layer provided thereon, wherein the coating material layer contains two or more types of coloring granules having different colors, and at least one type of the coloring granules are transparent coloring granules containing a water-borne resin, chromatic color particles and/or black particles and having the same color as that of the colored undercoating material layer.
2. The coating (laminate) structure according to item 1, wherein the transparent coloring granules are a granulated transparent colorant, and the transparent colorant contains a water-borne resin, chromatic color particles, and/or black particles and is capable of forming a transparent colored coating with a contrast ratio of 80% or less.
3. A coating (laminate) structure including a base material,

a colored undercoating material layer provided on the base material, and a coating material layer provided thereon, wherein the coating material layer contains two or more types of coloring granules having different colors, and at least one
5 type of the coloring granules are transparent coloring granules containing a water-borne resin, chromatic color particles and/or black particles, and achromatic color particles (exclusive of black particles) with an average particle size of 0.4 μm or more and a refractive index of 1.4 to 2.0 and having
10 the same color as that of the colored undercoating material layer.

4. The coating (laminate) structure according to item 3, wherein the transparent coloring granules are a granulated transparent colorant, and the transparent colorant contains a
15 water-borne resin, chromatic color particles and/or black particles, and achromatic color particles (exclusive of black particles) with an average particle size of 0.4 μm or more and a refractive index of 1.4 to 2.0 and is capable of forming a transparent colored coating with a contrast ratio of 80% or
20 less.

5. The coating (laminate) structure according to any one of items 1 to 4, wherein the coating material layer has a dry thickness of 50 to 2,000 μm at its bump part.

[0022]

25 (Third Aspect of the Invention)

As a result of earnest study to solve the problems, the inventors have also completed the invention by developing a laminate (coating) structure including a specific colored undercoating material layer and a specific coating material layer provided thereon.

[0023]

Specifically, the invention has the following features.

1. A laminate structure including a colored undercoating material layer and a coating material layer provided thereon, wherein the colored undercoating material layer has infrared reflecting properties, the coating material layer contains two or more types of coloring granules having different colors, and at least one type of the coloring granules are transparent coloring granules containing a water-borne resin, chromatic color particles and/or black particles.

2. The laminate structure according to item 1, wherein the transparent coloring granules are a granulated transparent colorant, and the transparent colorant contains a water-borne resin, chromatic color particles, and/or black particles and is capable of forming a transparent colored coating with a contrast ratio of 80% or less.

3. A laminate structure including a colored undercoating material layer and a coating material layer provided thereon, wherein the colored undercoating material layer has infrared reflecting properties, the coating material layer contains two

or more types of coloring granules having different colors, and at least one type of the coloring granules are transparent coloring granules containing a water-borne resin, chromatic color particles and/or black particles, and achromatic color particles (exclusive of black particles) with an average particle size of 0.4 μm or more and a refractive index of 1.4 to 2.0.

4. The laminate structure according to item 3, wherein the transparent coloring granules are a granulated transparent colorant, and the transparent colorant contains a water-borne resin, chromatic color particles and/or black particles, and achromatic color particles (exclusive of black particles) with an average particle size of 0.4 μm or more and a refractive index of 1.4 to 2.0 and is capable of forming a transparent colored coating with a contrast ratio of 80% or less.

5. The laminate structure according to any one of items 1 to 4, wherein the coating material layer has a dry thickness of 50 to 2,000 μm at its bump part.

20 EFFECT OF THE INVENTION

[0024]

The coating material of the invention can form a coating having transparency, a sense of depth, and other appearance features (aesthetic properties). The coating material of the invention is relatively lightweight and makes it possible to

form such a fine and beautiful coating with a single material. The use of the coating material of the invention also makes it possible to create a natural stone-like aesthetic as if various natural stones are used. The laminate (coating) structure of the invention has transparency, a sense of depth, and other appearance features (aesthetic properties) and can also produce a pattern-enlarging aesthetic effect. The laminate (coating) structure of the invention is relatively lightweight and can also create a natural stone-like aesthetic as if various natural stones are used. The structure of the invention is also effective in suppressing temperature rise caused by sunlight or the like.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025]

Fig. 1 is a cross-sectional view showing an example of application of the invention.

Fig. 2 is a cross-sectional view showing another example of application of the invention.

20

MODE FOR CARRYING OUT THE INVENTION

[0026]

Hereinafter, embodiments (the first, second, and third aspects of the invention) for carrying out the invention will be described.

[0027]

(First Aspect of the Invention)

The coating material of the invention includes a dispersion of two or more types of coloring granules with
5 different colors in an aqueous medium. The coloring granules contain at least one type of granulated transparent colorant (transparent coloring granules).

[0028]

(Transparent Colorant)

10 The transparent colorant contains (a) a water-borne resin and (b) chromatic color particles and/or black particles. The transparent colorant is capable of forming a transparent colored coating with a contrast ratio of 80% or less (preferably 5 to 70%, more preferably 10 to 60%, even more preferably 15
15 to 50%). Such properties will contribute to imparting transparency, a sense of depth, and other appearance features. If the contrast ratio of the transparent colorant is too high, it will be difficult to obtain a sufficient level of transparency, a sense of depth, and other appearance features.

20 [0029]

The term "contrast ratio" refers to the value determined by a method including applying the sample to a hiding chart using a film applicator (300 μ m gap), drying the applied sample in an environment at a temperature of 23°C and a humidity of 50%
25 (hereinafter referred to as "the standard conditions") for 48

hours to form a test piece, measuring the luminous reflectance of the test piece, and then calculating the value from the following formula.

<Formula> Contrast Ratio (%) = (the luminous reflectance of the
5 coating on the black portion) / (the luminous reflectance of the coating on the white portion) x 100

[0030]

The water-borne resin (hereinafter also referred to as the "component (a)") in the transparent colorant has a function
10 as a vehicle, which is preferably capable of forming a transparent coating. Examples of the resin in the component (a) include acrylic resin, urethane resin, vinyl acetate resin, silicone resin, fluoro resin, vinyl acetate-acrylic resin, acrylic urethane resin, acrylic silicone resin, etc. These
15 resins may be used singly or in combination of two or more. The component (a) is preferably in the form of an aqueous resin dispersion (resin emulsion). The component (a) may also have crosslinking reactivity.

The content of the component (a) in the transparent
20 colorant is preferably from 5 to 50% by weight, more preferably from 10 to 40% by weight, on a solid basis.

[0031]

In the transparent colorant, the component (b) is chromatic color particles and/or black particles (hereinafter
25 also referred to as the "component (b)"). Among them, the

chromatic color particles are particles having a chromatic color, such as yellow, orange, red, green, blue, or violet. For example, such chromatic color particles are made of an inorganic material such as ferric oxide, yellow iron oxide, iron oxide, 5 ultramarine blue, cobalt blue, or cobalt green; or an organic material such as an azo compound, a naphthol compound, a pyrazolone compound, an anthraquinone compound, a perylene compound, a quinacridone compound, a disazo compound, an isoindolinone compound, a benzimidazole compound, a 10 phthalocyanine compound, or a quinophthalone compound.

On the other hand, the black particles are particles having a black color, for example, which are made of an inorganic material such as iron black, iron-manganese complex oxide, iron-copper-manganese complex oxide, iron-chromium-cobalt 15 complex oxide, copper-chromium complex oxide, or copper-manganese-chromium complex oxide; or other materials such as carbon black.

The component (b) is preferably an inorganic material, and especially, an inorganic oxide is preferred.

20 [0032]

In the invention, one, two, or more selected from these chromatic color particles and black particles may be used to form a transparent colorant (transparent coloring granules) of the desired color.

25 The content of the component (b) in the transparent

colorant is preferably from 0.001 to 5% by weight, more preferably from 0.005 to 3% by weight, even more preferably from 0.01 to 2% by weight. Such a content makes it easy to obtain the aesthetic effect of the invention.

5 [0033]

In the transparent colorant, the component (b) preferably has an average particle size of 0.4 μm or more (more preferably 0.4 to 5 μm , even more preferably 0.5 to 2 μm). The transparent colorant containing the component (b) with such a size can
10 easily produce transparency, a sense of depth, and other esthetic features and are also advantageous in suppressing temperature rise or producing other effects. Even after the coating material is stored for a long term, such effects can be steadily obtained.

15 Particles of the component (b) having such an average particle size preferably makes up 20% by weight or more (more preferably 40% by weight or more, even more preferably 60% by weight or more) of the total weight of the component (b). In a preferred embodiment, the component (b) consists of particles
20 with such an average particle size. The average particle size of the component (b) can be determined using a laser diffraction particle size analyzer.

[0034]

In the invention, the transparent colorant preferably
25 contains (c) achromatic color particles with an average

particle size of 0.4 μm or more and a refractive index of 1.4 to 2.0 (hereinafter also referred to as the "component (c)"). The component (c) with such physical properties can increase transparency, a sense of depth, and other appearance features and contribute to the aesthetic effect of the invention. Such an aesthetic effect is considered to be produced when the component (c) scattered on the surface or in the inside of the transparent coloring granules produces effects such as transmission, reflection, and refraction. The component (c) with such properties can further contribute to improving the physical properties of the formed coating, such as drying property, adhesion, water resistance, temperature rise-suppressing ability, non-adherence, fire resistance, and strength. It should be noted that the component (c) does not include black particles.

[0035]

Common colorants are produced using titanium dioxide as white particles, but aesthetic properties including transparency and a sense of depth can hardly be obtained using colorants composed mainly of titanium dioxide. In contrast, an unconventional, unique, aesthetic effect can be obtained when the component (c) is used as an essential component in the invention.

[0036]

The component (c) generally has an average particle size

of 0.4 μm or more, preferably 0.5 μm or more, more preferably 1 μm or more. The average particle size of the component (c) preferably has an upper limit of 500 μm or less, more preferably 200 μm or less, even more preferably 100 μm or less. The average
5 particle size of the component (c) can be determined using a laser diffraction particle size analyzer.

The component (c) generally has a refractive index of 1.4 to 2.0, preferably 1.45 to 1.7. The refractive index can be measured using an Abbe refractometer.

10 [0037]

The component (c) is preferably such that it looks white in the air but looks transparent when placed in a coating of a transparent water-borne resin. More specifically, a mixture prepared by mixing the water-borne resin and the component (c)
15 in a solid content ratio of 7:3 and adjusting the solid content to 25% by weight is preferably capable of forming a coating with a contrast ratio of 20% or less, more preferably 3 to 10%, even more preferably 4 to 8%. In this context, the term "contrast ratio" refers to the value determined by a method including
20 applying the mixture to a hiding chart using a film applicator (300 μm gap), drying the applied mixture under the standard conditions for 48 hours to form a test piece, and determining the value from the formula shown above using the test piece.

[0038]

25 Examples of the component (c) include inorganic materials

such as aluminum silicate, magnesium silicate, barium sulfate, silicon dioxide, and calcium carbonate; and organic materials such as resin particles. In general, these materials are not artificially colored. In addition, these materials are preferably solid. In the invention, the component (c) is preferably inorganic particles, and silicon dioxide or barium sulfate is particularly preferred. The component (c) containing such particles makes it easy to obtain the advantageous effect of the invention.

10 The content of the component (c) in the transparent colorant is preferably from 0.5 to 50% by weight, more preferably from 1 to 25% by weight, even more preferably from 2 to 10% by weight. Such a content is advantageous in terms of the aesthetic effect, the effect of improving the physical properties of the coating, or other effects.

15 [0039]

 In addition to the components described above, the transparent colorant preferably contains a water-soluble polymer compound. Such a water-soluble polymer compound can contribute to stabilizing the production of the transparent coloring granules. Examples of the water-soluble polymer compound include polyvinyl alcohol, poly(meth)acrylic acid, polyethylene oxide, water-soluble urethane, biogum, galactomannan derivatives, alginic acid or derivatives thereof, cellulose derivatives, gelatin, casein, albumin, and products

derived from them by chemical modification such as oxidation, methylation, carboxymethylation, hydroxyethylation, hydroxypropylation, sulfation, phosphorylation, or cationization. These may be used singly or in combination of
5 two or more. It should be noted that the water-soluble polymer is a different material from the aqueous resin dispersion.

The content of the water-soluble polymer compound in the transparent colorant is preferably from 0.1 to 10 parts by weight, more preferably from 0.3 to 5 parts by weight, on a solid
10 basis.

[0040]

The transparent colorant preferably contains an aqueous medium. The aqueous medium contains water as a main component and optionally contains a water-soluble solvent. Usually,
15 water makes up 80% by weight or more (preferably 90% by weight or more) of the aqueous medium.

[0041]

The transparent colorant preferably contains a hydrophobic solvent in addition to the components described
20 above. The hydrophobic solvent is advantageously effective in improving the drying properties, water resistance, and other properties of the formed coating, and particularly effective in improving these physical properties at the initial stage of the coating formation. The hydrophobic solvent preferably has
25 a solubility in water (at 20°C) of 5 g/100 g or less, more

preferably 1 g/100 g or less, even more preferably 0.1 g/100 g or less, most preferably 0.08 g/100 g or less.

Examples of the hydrophobic solvent include ethylene glycol mono 2-ethylhexyl ether, diethylene glycol mono
5 2-ethylhexyl ether, diethylene glycol dibutyl ether,
2-ethyl-1-hexanol, 2,2,4-trimethyl-1,3-pentanediol
monoisobutyrate, 2,2,4-trimethyl-1,3-pentanediol
diisobutyrate, etc.

The content of the hydrophobic solvent in the transparent
10 colorant is preferably from 0.5 to 15% by weight, more
preferably from 1 to 10% by weight.

[0042]

As long as the effects of the invention are not
significantly impaired, the transparent colorant may contain
15 any of various additives such as a viscosity modifier, a wetting
agent, a dispersing agent, a plasticizer, a film-forming aid,
an antifreezing agent, a pH controlling agent, an antiseptic
agent, an antifungal agent, an anti-algae agent, an
antibacterial agent, an antifoaming agent, a light stabilizer,
20 a perfume, an ultraviolet absorbing agent, a catalyst, a
crosslinking agent, and a flame retardant. The content of
titanium oxide as a common white powdery material is preferably
as low as possible. The content of titanium oxide in the
transparent colorant is preferably 3% by weight or less, more
25 preferably 2% by weight or less, even more preferably 1% by

weight or less, most preferably 0.5% by weight or less.

The transparent colorant can be produced by uniformly mixing the components with one another using a conventional method.

5 [0043]

(Aqueous Medium)

The aqueous medium in the coating material of the invention serves as a medium for the coloring granules.

Examples of the aqueous medium that may be used include the same
10 as those listed above for the transparent colorant. The aqueous medium may contain a water-soluble solvent, and in this case, the content of the water-soluble solvent is preferably 20% by weight or less, more preferably 10% by weight or less, based on the total weight of water and the water-soluble solvent.

15 [0044]

The aqueous medium preferably contains a gelling agent. The gelling agent is a component that can contribute to stabilizing the production of the coloring granules by acting with the water-soluble polymer compound.

20 A material capable of gelling the water-soluble polymer compound may be used as the gelling agent. Examples of the gelling agent include sulfates, acetates, organic acid salts, silicates, borates, nitrates, chlorides, or hydroxides of metal such as magnesium, calcium, barium, aluminum, sodium, potassium,
25 zinc, iron, zirconium, chromium, tin, silver, or copper. Other

examples include inorganic acids such as hydrochloric acid, sulfuric acid, nitric acid, and boric acid and salts thereof; and organic acids such as citric acid, lactic acid, and tannic acid and salts thereof. These gelling agents may be used singly
5 or in combination of two or more.

The content of the gelling agent in the aqueous medium is preferably from 0.01 to 1.5% by weight, more preferably from 0.03 to 1.0% by weight, even more preferably from 0.05 to 0.5% by weight.

10 [0045]

In the coating material of the invention, the aqueous medium may also contain a water-borne resin. This water-borne resin can contribute to increasing the effect of anchoring and protecting the coloring granules in the formed coating and also
15 to improving the physical properties such as water resistance and weather resistance. Examples of the water-borne resin that may be used include the same as those for the transparent colorant, and the water-borne resin is preferably an aqueous resin dispersion (resin emulsion).

20 In the invention, the aqueous medium more preferably contains an aqueous resin dispersion and a hydrophobic solvent. The hydrophobic solvent is advantageously effective in improving the drying properties, water resistance, and other properties of the formed coating, and particularly effective
25 in improving these physical properties at the initial stage of

the coating formation. Examples of the hydrophobic solvent that may be used include those listed above for the transparent colorant. The hydrophobic solvent preferably has a solubility in water (at 20°C) of 5 g/100 g or less, more preferably 1 g/100 g or less, even more preferably 0.1 g/100 g or less, most preferably 0.08 g/100 g or less.

The content of the water-borne resin in the aqueous medium is preferably from 5 to 50% by weight, more preferably from 10 to 40% by weight, on a solid basis.

10 The content of the hydrophobic solvent in the aqueous medium is preferably from 0.5 to 30% by weight, more preferably from 1 to 25% by weight.

[0046]

As long as the effects of the invention are not significantly impaired, the aqueous medium may also contain any of various additives (such as those for the transparent colorant). The aqueous medium may also contain the component (c).

The aqueous medium can be produced by uniformly mixing the above components using a conventional method.

[0047]

(Method for Producing the Coating Material)

The coating material of the invention contains at least one type of transparent coloring granules as coloring granules.

25 Such transparent coloring granules can be produced by

dispersing the transparent colorant in the form of granules in the aqueous medium. The transparent coloring granules preferably have a particle size of 0.1 to 15 mm, more preferably 0.5 to 12 mm, even more preferably 1 to 10 mm. The particle size and shape of the transparent coloring granules can be adjusted by appropriately selecting and/or controlling the type of the stirring blade, the rotational speed of the stirring blade, the viscosity of the transparent colorant, the method of adding the transparent colorant, the viscosity or composition of the aqueous medium, or other conditions.

[0048]

Coloring granules other than the transparent coloring granules can be produced by dispersing, in the form of granules in the aqueous medium, a colorant containing the components (a) and (b) and optional components. Such a colorant will form a coating with a contrast ratio of more than 80%. Taking such conditions into account, such a colorant can be prepared according to a similar formulation to that of the transparent colorant. Such a colorant can also be granulated using a similar method to that for the transparent colorant.

[0049]

The coating material of the invention, which contains at least one type of transparent coloring granules, preferably contains two or more (more preferably three or more) types of transparent coloring granules with different colors. In other

words, it is preferable to mix transparent coloring granules having different two or more (more preferably three or more) colors. The transparent coloring granules preferably make up 20 to 100% by weight, more preferably 50 to 95% by weight of
5 the coloring granules.

The coating material containing two or more types of coloring granules with different colors can be obtained, for example, using

a method including separately preparing dispersions each
10 containing coloring granules (transparent coloring granules) of a single color and then mixing these dispersions, or

a method including adding and dispersing two or more colorants (transparent colorants) with different colors simultaneously or sequentially into the aqueous medium.

15 The content of the coloring granules in the aqueous medium is preferably from 30 to 90% by weight, more preferably from 40 to 80% by weight.

[0050]

(Coating Method)

20 The coating material of the invention can be used to form a coating on the surface of buildings, civil engineering structures, and other structures. More specifically, for example, the coating material of the invention can be used as a surface coating material for various base materials such as
25 concrete, mortar, siding boards, extruded panels, gypsum boards,

pearlite boards, plywood boards, bricks, plastic boards, metal sheets, a glass material, and ceramic tiles. The surface of these base materials may have undergone a certain surface treatment (for example, with a sealer, a surfacer, a filler, 5 a putty, or the like), may have been coated with a film, or may be coated with wallpaper. For example, the film can be formed on the surface of the base material by applying a colored undercoating material to the base material before the application of the coating material of the invention. Such a 10 colored undercoating material may be uniformly applied over the base material.

The surface of the base material may be flat or may have irregularities.

[0051]

15 A mixture of a resin and particles of each color may be used as the colored undercoating material. In this mixture, the resin is preferably a water-borne resin similar to that for the transparent colorant. The chromatic color particles, black particles, achromatic color particles, or other particles 20 may be used as the particles of each color. The color of the colored undercoating material can be adjusted by appropriately selecting the type and content of the particles. The colored undercoating material preferably has a contrast ratio of 80% or more, more preferably 85% or more, even more preferably 90% 25 or more.

The colored undercoating material can be applied using any of various applicators such as a spray, a roller, and a brush. The undercoating material is preferably applied in an amount of 0.05 to 0.8 kg/m², more preferably 0.1 to 0.5 kg/m².

5 [0052]

In the invention, the coating material is applied to such a base material to form a coating. The application can be performed using any of various applicators such as a spray, a roller, and a brush. The coating material of the invention is
10 preferably applied in an amount of 0.1 to 1 kg/m², more preferably 0.2 to 0.8 kg/m². After the application, drying is generally performed at room temperature, although drying may be performed by heating.

The coating formed using the coating material of the
15 invention generally has bumps and dents to a certain extent. The dry thickness of the coating at bump parts is preferably 50 μm or more, more preferably 100 μm or more, even more preferably 300 μm or more, still more preferably 500 μm or more. The dry thickness of the coating at bump parts preferably has
20 an upper limit of 2,000 μm or less, more preferably 1,800 μm or less, even more preferably 1,500 μm or less. Even with such a relatively large thickness, the coating material of the invention can produce a sufficient level of aesthetic effect with respect to transparency, a sense of depth, and other
25 appearance features. The dry thickness of the coating at bump

parts refers to the thickness of the coating (coating material layer) formed by drying the coating material, which is calculated as the average thickness of "the coating material layer having bumps". More specifically, the dry thickness of the coating can be determined as follows. Ten parts of the coating material layer having bumps are selected to be measured, and the thickness of the "coating material layer having bumps" is measured at the ten parts, or if the "base material or the like" is included, the "total thickness" including the thickness of the "base material or the like" is measured at the ten parts. Subsequently, the thickness of the "base material or the like" is subtracted from the "total thickness," and the average value is calculated.

After the coating material of the invention is applied, if necessary, a transparent coating material or the like may also be applied. A material capable of forming a hydrophilic coating may be used as the transparent coating material to improve antifouling properties.

[0053]

According to the invention, various coating (laminate) structures can be obtained using the coating material. For example, when the colored undercoating material and the coating material of the invention are applied, the resulting coating (laminate) structure includes a base material, a colored undercoating material layer provided on the base material, and

a coating material layer formed thereon using the coating material of the invention. When the transparent coating material is further applied, the resulting coating (laminate) structure further includes a transparent coating material layer
5 formed on the coating material layer using the coating material of the invention.

[0054]

(Second Aspect of the Invention)

Hereinafter, embodiments for carrying out the invention
10 will be described. Fig. 1 shows an example of the coating (laminate) structure of the invention. Fig. 1 is a cross-sectional view of the coating (laminate) structure.

[0055]

The invention is applicable to surface coatings for
15 buildings, civil engineering structures, and other structures.

In the invention, for example, the base material 1 may be a concrete material, a mortar material, a siding board, an extruded panel, a gypsum board, a perlite board, a plywood board, a brick, a plastic board, a metal sheet, a glass material,
20 a ceramic tile, or the like. The surface of the base material 1 may have undergone a certain surface treatment (for example, with a sealer, a surfacer, a filler, a putty, or the like), may have been coated with a film, or may be coated with wallpaper. The base material 1 may be flat or have irregularities.

25 [0056]

A colored undercoating material layer 2 is provided on the surface of the base material 1. The colored undercoating material layer 2 can be formed by applying a colored undercoating material to the base material 1. The colored undercoating material may be uniformly applied over the base material.

[0057]

The colored undercoating material to be used may be a mixture of a resin and particles of each color. Examples of the resin include acrylic resin, urethane resin, vinyl acetate resin, silicone resin, fluororesin, vinyl acetate-acrylic resin, acrylic urethane resin, acrylic silicone resin, etc. These resins may be used singly or in combination of two or more. Although the resin may be in any form, an aqueous resin dispersion (resin emulsion) is preferred.

[0058]

The chromatic color particles, black particles, or achromatic color particles, or other particles may be used as the particles of each color. The color of the colored undercoating material can be adjusted by appropriately selecting the type and content of the particles. The content of the particles is preferably from 5 to 500 parts by weight, more preferably from 10 to 400 parts by weight, based on 100 parts by weight of the resin solid. The colored undercoating material preferably has a contrast ratio of 80% or more, more

preferably 85% or more, even more preferably 90% or more.

The colored undercoating material may be applied using any of various applicators such as a spray, a roller, and a brush. The colored undercoating material is preferably applied in an amount of 0.05 to 0.8 kg/m², more preferably 0.1 to 0.5 kg/m².
[0059]

The coating (laminate) structure of the invention includes a colored undercoating material layer 2 and a coating material layer 3 provided thereon. The coating material layer 3 includes two or more types of coloring granules having different colors. The coloring granules contain transparent coloring granules having the same color as that of the colored undercoating material layer. The coating material layer 3 may include discontinuous coatings. The transparent coloring granules preferably have a particle size of 0.1 to 15 mm, more preferably 0.5 to 12 mm, even more preferably 1 to 10 mm.
[0060]

As used herein, the term "the same color" means that the colors visually look substantially the same. More specifically, it means that the color difference is generally 5 or less (preferably 4 or less, more preferably 3 or less). The color difference (ΔE) can be determined by measuring the color data (L^* , a^* , b^*) of the objects (the surface part of the colored undercoating material layer and the transparent coloring granules-containing part on the colored undercoating

material layer). The color difference can be determined using a color-difference meter.

On the other hand, the term "different colors" means that the colors visually look different, and the color difference
5 is generally more than 5 (preferably 6 or more, more preferably 8 or more).

[0061]

In the invention, the coating material layer 3 containing the transparent coloring granules can impart transparency, a
10 sense of depth, and other appearance features and can also form an enlarged pattern. Such advantageous effects are considered to be produced by visual effects caused when the coloring granules have transparency and also have the same color as that of the colored undercoating material layer.

15 [0062]

The coating material layer 3 can be formed by the method (1) or (2) described below.

(1) A method of applying a coating material that includes an aqueous medium and at least two types of coloring granules with
20 different colors (in which at least one type of coloring granules are transparent coloring granules, specifically, a granulated transparent colorant) dispersed in the aqueous medium.

(2) A method of applying, in the form of granules, at least
25 two colorants having different colors (the colorants include

at least one transparent colorant).

[0063]

In the methods (1) and (2), the transparent colorant preferably contains (a) a water-borne resin and (b) chromatic
5 color particles and/or black particles. The transparent colorant is preferably capable of forming a transparent colored coating with a contrast ratio of 80% or less (more preferably 5 to 70%, even more preferably 10 to 60%, still more preferably 15 to 50%). Such properties will contribute to imparting
10 transparency, a sense of depth, pattern-enlarging effects, and other appearance features. If the transparent colorant has an insufficient level of transparency, such effects will be difficult to obtain.

The transparent colorant to be used may be the same as
15 described above for the first aspect of the invention.

[0064]

Besides the transparent coloring granules, a granulated colorant less transparent than the transparent colorant may be used as coloring granules. Such a colorant may include the
20 components (a) and (b) and optional components. Such a colorant will form a coating preferably with a contrast ratio of more than 80% (more preferably 85% or more, even more preferably 90% or more). Taking such conditions into account, such a colorant can be prepared according to a similar formulation to that of
25 the transparent colorant.

[0065]

In the method (1), the coating material contains at least one type of transparent coloring granules as coloring granules. Such coloring granules can be produced by dispersing the
5 colorant (transparent colorant) in the form of granules in an aqueous medium. The aqueous medium to be used may be the same as described above for the transparent colorant, and if necessary, may contain a gelling agent, a water-borne resin, and other additives.

10 The content of the coloring granules in the aqueous medium is preferably from 30 to 90% by weight, more preferably from 40 to 80% by weight. The coloring granules preferably have a particle size of 0.1 to 15 mm, more preferably 0.5 to 12 mm, even more preferably 1 to 10 mm.

15 [0066]

In the method (1), the coating material layer 3 can be efficiently formed by a single coating process. The coating process can be performed using any of various applicators such as a spray, a roller, and a brush. The coating material is
20 preferably applied in an amount of 0.1 to 1 kg/m², more preferably 0.2 to 0.8 kg/m². After the coating process, drying is generally performed at room temperature, although drying may also be performed by heating.

[0067]

25 The method (2) can be performed using a coating process

capable of granulating a colorant (transparent colorant) during the coating process. In the method (2), spray coating is particularly preferred. The colorants may be applied simultaneously or sequentially. A multi-head type spray
5 coating machine or the like may be used as an applicator to apply two or more colorants simultaneously. The colorant is preferably applied in an amount of 0.01 to 0.8 kg/m².

[0068]

The coating material layer 3 generally has bumps and dents
10 to a certain extent, and the dry thickness of the coating material layer 3 at bump parts is preferably 50 μm or more, more preferably 100 μm or more, even more preferably 300 μm or more, still more preferably 500 μm or more. The dry thickness of the layer at bump parts preferably has an upper limit of 2,000 μm
15 or less, more preferably 1,800 μm or less, even more preferably 1,500 μm or less. In the invention, the coating material layer 3 can produce a sufficient level of aesthetic effect with respect to transparency, a sense of depth, and other appearance features, even when it is relatively thick. The dry thickness
20 at bump parts is measured by the same method as described above for the first aspect of the invention.

[0069]

The coating material layer 3, which contains at least one type of transparent coloring granules, preferably contains two
25 or more (more preferably three or more) types of transparent

coloring granules with different colors. In other words, it is preferable to mix transparent coloring granules having different two or more (more preferably three or more) colors. The transparent coloring granules preferably make up 20 to 100%
5 by weight, more preferably 50 to 95% by weight of the coloring granules.

[0070]

If necessary, a transparent layer may be formed on the coating material layer 3. The transparent layer can be formed
10 by applying a transparent coating material. A transparent coating material capable of forming a hydrophilic coating may also be used to increase antifouling properties.

[0071]

(Third Aspect of the Invention)

15 Hereinafter, embodiments for carrying out the invention will be described.

[0072]

The invention is applicable to surface coatings for buildings, civil engineering structures, and other structures.
20 Fig. 1 shows an example of application of the invention. Fig. 1 is a cross-sectional view of a laminate structure of the invention laminated on a base material 1. For example, such a laminate structure can be formed by applying each layer-forming material to the base material 1.

25 [0073]

The base material 1 forms the surface of a building, a civil engineering structure, or any other structure. Examples of the base material 1 that may be used include the same as those of the base material 1 described above for the second aspect
5 of the invention.

[0074]

The laminate structure of the invention includes a colored undercoating material layer 2 and a coating material layer 3 provided thereon. In the embodiment of Fig. 1, the
10 colored undercoating material layer 2 can be formed by applying a colored undercoating material to the base material 1. Such a colored undercoating material may be uniformly applied over the base material.

[0075]

15 The colored undercoating material layer 2 can contribute to the effect of suppressing temperature rise. In the invention, infrared reflecting properties may be imparted to the colored undercoating material layer 2, and for this purpose, a material containing a resin, an infrared reflective powder, and optional
20 components may be used as the colored undercoating material. Examples of the resin for use in this material include acrylic resin, urethane resin, vinyl acetate resin, silicone resin, fluororesin, vinyl acetate-acrylic resin, acrylic urethane resin, acrylic silicone resin, etc. These resins may be used
25 singly or in combination of two or more. Although the resin

may be in any form, an aqueous resin dispersion (resin emulsion) is preferred.

[0076]

Examples of the infrared reflective powder include
5 powders of aluminum flake, titanium oxide, barium sulfate, zinc
oxide, calcium carbonate, silicon oxide, magnesium oxide,
zirconium oxide, yttrium oxide, indium oxide, alumina,
iron-chromium complex oxide, manganese-bismuth complex oxide,
manganese-yttrium complex oxide, etc. These may be used singly
10 or in combination of two or more.

The content of the infrared reflective powder is preferably from 5 to 800 parts by weight, more preferably from 10 to 600 parts by weight, based on 100 parts by weight of the resin solid.

15 [0077]

The colored undercoating material may also contain an infrared transparent powder. The infrared transparent powder may be used in combination with other materials, so that a wide variety of colors can be produced. Examples of the infrared
20 transparent powder include powders of perylene pigments, azo pigments, chrome yellow, red iron oxide, vermilion, titanium red, cadmium red, quinacridone red, isoindolinone, benzimidazolone, phthalocyanine green, phthalocyanine blue, cobalt blue, indanthrene blue, ultramarine blue, Prussian blue,
25 etc. These may be used singly or in combination of two or more.

The content of the infrared transparent powder is preferably from 1 to 200 parts by weight, more preferably 2 to 100 parts by weight, based on 100 parts by weight of the resin solid.

5 [0078]

If necessary, the colored undercoating material may contain any of various additives such as a viscosity modifier, a wetting agent, a dispersing agent, a plasticizer, a film-forming aid, an antifreezing agent, a pH controlling agent,
10 an antiseptic agent, an antifungal agent, an anti-algae agent, an antibacterial agent, an antifoaming agent, a light stabilizer, a perfume, a hollow material, an ultraviolet absorbing agent, a catalyst, a crosslinking agent, and a flame retardant.

15 The colored undercoating material may be applied using any of various applicators such as a spray, a coater, a roller, and a brush. The colored undercoating material is preferably applied in an amount of 0.05 to 1 kg/m², more preferably 0.1 to 0.8 kg/m².

20 [0079]

The laminate structure of the invention has a coating material layer 3 on the colored undercoating material layer 2. The coating material layer 3 includes two or more types of coloring granules having different colors. The coloring
25 granules contain transparent coloring granules. The coating

material layer 3 may include discontinuous coatings. The transparent coloring granules preferably a particle size of 0.1 to 15 mm, more preferably 0.5 to 12 mm, even more preferably 1 to 10 mm. In the invention, the coating material layer 3 containing the transparent coloring granules can produce transparency, a sense of depth, and other appearance features. [0080]

The coating material layer 3 can be formed by the method (1) or (2) described below.

(1) A method of applying a coating material that includes an aqueous medium and at least two types of coloring granules with different colors (in which at least one type of coloring granules are transparent coloring granules, specifically, a granulated transparent colorant) dispersed in the aqueous medium.

(2) A method of applying, in the form of granules, at least two colorants having different colors (the colorants include at least one transparent colorant).

[0081]

In the methods (1) and (2), the transparent colorant preferably contains (a) a water-borne resin and (b) chromatic color particles and/or black particles. The transparent colorant is preferably capable of forming a transparent colored coating with a contrast ratio of 80% or less (more preferably 5 to 70%, even more preferably 10 to 60%, still more preferably

15 to 50%). Such properties will contribute to imparting transparency, a sense of depth, and other appearance features. If the transparent colorant has an insufficient level of transparency, such effects will be difficult to obtain. The
5 transparent colorant to be used may be the same as described above for the first aspect of the invention.

[0082]

The coating material layer 3 preferably contains transparent coloring granules having the same color as that of
10 the colored undercoating material layer 2. In this mode, a pattern enlarging effect can be obtained in addition to transparency, a sense of depth, and other appearance features. Such an advantageous effect is considered to be produced by visual effects caused when the coloring granules have
15 transparency and also have the same color as that of the colored undercoating material layer.

[0083]

As used herein, the term "the same color" means that the colors visually look substantially the same. More
20 specifically, it means the same as described above for the second aspect of the invention.

[0084]

Besides the transparent coloring granules, a granulated colorant less transparent than the transparent colorant may be
25 used as coloring granules. Such a colorant may include the

components (a) and (b) and optional components. Such a colorant will form a coating preferably with a contrast ratio of more than 80% (more preferably 85% or more, even more preferably 90% or more). Taking such conditions into account, such a colorant
5 can be prepared according to a similar formulation to that of the transparent colorant.

[0085]

In the method (1), the coating material contains at least one type of transparent coloring granules as coloring granules.
10 Such coloring granules can be produced by dispersing the colorant (transparent colorant) in the form of granules in an aqueous medium. The aqueous medium to be used may be the same as described above for the transparent colorant, and if
15 and other additives.

The content of the coloring granules in the coating material is preferably from 30 to 90% by weight, more preferably from 40 to 80% by weight. The coloring granules preferably have a particle size of 0.1 to 15 mm, more preferably 0.5 to 12 mm,
20 even more preferably 1 to 10 mm.

[0086]

In the method (1), the coating material preferably contains the component (c) in addition to the coloring granules. In this case, the coating material includes a dispersion of the
25 coloring granules and the component (c) in the aqueous medium,

and the coating material layer 3 contains a mixture of these materials. The content of the component (c) (exclusive of the component (c) in the coloring granules) in the coating material is preferably from 2 to 50% by weight, more preferably from 5
5 to 30% by weight.

The coating material layer 3 containing a mixture of the coloring granules and the component (c) can produce a higher level of aesthetic effects, such as transparency and a sense of depth, and can further improve other properties of the formed
10 coating, such as drying property, adhesion, water resistance, temperature rise-suppressing ability, non-adherence, fire resistance, and strength.

[0087]

In the method (1), the coating material layer 3 can be
15 efficiently formed by a single coating process. The coating process can be performed using any of various applicators such as a spray, a coater, a roller, and a brush. The coating material is preferably applied in an amount of 0.1 to 1 kg/m², more preferably 0.2 to 0.8 kg/m². After the coating process,
20 drying is generally performed at room temperature, although drying may also be performed by heating. Before the coating material is dried, a roller or any other tool may be pressed against the surface of the coating material layer 3.

[0088]

25 The method (2) can be performed using a coating process

capable of granulating a colorant (transparent colorant) during the coating process. In the method (2), spray coating is particularly preferred. The colorants may be applied simultaneously or sequentially. A multi-head type spray coating machine or the like may be used as an applicator to apply two or more colorants simultaneously. The colorant is preferably applied in an amount of 0.01 to 0.8 kg/m².

[0089]

The coating material layer 3 generally has bumps and dents to a certain extent, and the dry thickness of the coating material layer 3 at bump parts is preferably 50 μm or more, more preferably 100 μm or more, even more preferably 300 μm or more, still more preferably 500 μm or more. The dry thickness of the layer at bump parts preferably has an upper limit of 2,000 μm or less, more preferably 1,800 μm or less, even more preferably 1,500 μm or less. In the invention, the coating material layer 3 can produce a sufficient level of aesthetic effect with respect to transparency, a sense of depth, and other appearance features, even when it is relatively thick. The dry thickness at bump parts is measured by the same method as described above for the first aspect of the invention.

[0090]

The coating material layer 3, which contains at least one type of transparent coloring granules, preferably contains two or more (more preferably three or more) types of transparent

coloring granules with different colors. In other words, it is preferable to mix transparent coloring granules having different two or more (more preferably three or more) colors. The transparent coloring granules preferably make up 20 to 100%
5 by weight, more preferably 50 to 95% by weight of the coloring granules.

[0091]

If necessary, a transparent layer 4 may be formed on the coating material layer 3. The transparent layer 4 can be formed
10 by applying a transparent coating material. A transparent coating material capable of forming a hydrophilic coating may also be used to increase antifouling properties. The transparent coating material is preferably applied in an amount of 0.01 to 0.5 kg/m², more preferably 0.05 to 0.3 kg/m².

15 [0092]

In particular, the transparent layer 4 preferably contains an acrylic component and a silicic component. The weight ratio of the acrylic component to the silicic component is preferably from 100:10 to 100:90, more preferably from 100:20
20 to 100:70, on a solid basis. Such a transparent layer 4 is effective in increasing the effect of suppressing temperature rise.

[0093]

The acrylic component can be obtained by polymerization
25 of any of various (meth)acrylic monomers or copolymerization

of any of various (meth)acrylic monomers and any other monomer(s).

The silicic component may be silica, silicone, or the like, and silica is particularly preferred. For example, silica can
5 be produced using sodium silicate, lithium silicate, potassium silicate, or a silicate compound as a raw material. The particle size of silica is preferably from 1 to 200 nm, more preferably from 5 to 100 nm.

[0094]

10 The transparent coating material for use in forming such a transparent layer 4 preferably contains an acrylic resin emulsion and silica. In particular, the acrylic resin emulsion is preferably capable of reacting with silica. Specifically, the acrylic resin preferably has a functional group such as a
15 hydroxyl group or a hydrolyzable silyl group (more preferably a hydrolyzable silyl group).

[0095]

In the invention, a laminate structure having the colored undercoating material layer 2, the coating material layer 3,
20 and any optional layer(s) may be previously produced in the form of a sheet. The laminate structure of the invention can be previously produced in the form of a sheet using a known method. For example, the colored undercoating material layer 2, the coating material layer 3, and, if necessary, the transparent
25 layer 4 or any other optional layer(s) may be formed on a support

layer 5 by the coating process described above. Each material described above may be used to form each layer.

Fig. 2 shows a sheet-shaped laminate structure including the support layer 5, and the colored undercoating layer 2 and the coating material layer 3 laminated on the support layer 5.
[0096]

Examples of the support layer 5 include a woven fabric, a nonwoven fabric, a ceramic paper sheet, a synthetic paper sheet, a glass cloth, a mesh, a gypsum board, a plywood board, a slate sheet, a metal sheet, etc. The support layer 5 may be composed of two or more materials. The support layer 5 to be used may have infrared reflecting properties, thermal insulation properties, or other properties.
[0097]

The sheet-shaped laminate structure can be handled as a sheet-shaped product during distribution, and can be fixed to a variety of base materials 1 after transferred to construction sites for buildings, civil engineering structures, or other structures. The sheet-shaped laminate structure can be fixed to the base material 1 using an adhesive, a pressure-sensitive adhesive, a pressure-sensitive adhesive tape, nails, rivets, pins, a fastener, a rail, or the like.

According to the invention, labor in construction can be saved using the sheet-shaped laminate structure. In addition, forming the coating in advance makes it easy to control the

thickness and other properties, so that stable coating performance can be achieved.

The thickness of the sheet-shaped laminate structure is preferably, but not limited to, about 0.5 to about 8 mm.

5 Fig. 2 shows an example of application in which the sheet-shaped laminate structure is bonded to the base material 1 with an adhesive layer 6 interposed therebetween.

EXAMPLES

[0098]

10 Hereinafter, the features of the invention will be more specifically described with reference to examples.

[0099]

(Production of Colorant)

Production Example A (Production of Colorants A1 to A6)

15 A vessel was charged with 100 parts by weight of acrylic resin emulsion 1 (40% by weight solid and 60% by weight water), into which 6 parts by weight of solvent 1 (propylene glycol monobutyl ether with a solubility in water of 6.0 g/100 g), 80 parts by weight of gel-forming material 1 (an aqueous 3% by weight galactomannan solution), and 2 parts by weight of
20 antifoamer 1 (mineral oil-based) were mixed, and the respective powders were further mixed to form each colorant. The types and contents (% by weight in the colorant) of the powders and the contrast ratio of the colorant are shown in Table 1. The
25 contrast ratio of the colorant was determined by a method

including applying the colorant to a hiding chart using a film applicator (300 μm gap), drying the applied colorant under the standard conditions for 48 hours to form a test piece, and measuring the luminous reflectance of the test piece.

5 Each powder is as follows.

 - Yellow powder 1: yellow iron oxide (0.5 μm in average particle size)

 - Red powder 1: red iron oxide (0.6 μm in average particle size)

10 - Black powder 1: iron-manganese complex oxide (0.6 μm in average particle size)

 - Black powder 2: carbon black (0.1 μm in average particle size)

 - Achromatic color powder 1: titanium oxide (2.71 in refractive index, 0.3 μm in average particle size)

 - Achromatic color powder 2: silicon dioxide (1.55 in refractive index, 4 μm in average particle size)

 - Achromatic color powder 3: barium sulfate (1.64 in refractive index, 28 μm in average particle size)

20 - Achromatic color powder 4: silicon dioxide (1.55 in refractive index, 120 μm in average particle size)

[0100]

[Table 1]

		Color	Content (wt%) in colorant					Contrast ratio
			Yellow powder 1	Red powder 1	Black powder 1	Achromatic color powder 1	Achromatic color powder 2	
Colorant	A1	Gray	0.07	0.01	0.24	0.30	5.95	46%
	A2	Dark gray	0.03	—	0.35	0.14	5.95	36%
	A3	Red brown	0.12	0.09	0.13	0.11	6.30	35%
	A4	Black	0.06	—	0.54	—	5.60	40%
	A5	Light gray	—	—	0.03	0.48	6.30	38%
	A6	Light yellow	0.05	—	—	0.48	6.30	38%

[0101]

Production Example B (Production of Colorants B1 to B4)

Production Example C (Production of Colorants C1 to C4)

5 Production Example D (Production of Colorants D1 to D4)

A vessel was charged with 100 parts by weight of acrylic resin emulsion 1, into which 6 parts by weight of solvent 2 (2,2,4-trimethyl-1,3-pentanediol diisobutyrate with a solubility in water of 0.04 g/100 g), 80 parts by weight of gel-forming material 1, and 2 parts by weight of antifoamer 1 were mixed, and the respective powders were further mixed to form each colorant. The types and contents of the powders and the contrast ratio of the colorant are shown in Table 2.

[0102]

15 Production Example E (Production of Colorants E1 to E4)

Production Example F (Production of Colorants F1 to F4)

A vessel was charged with 100 parts by weight of acrylic resin emulsion 1, into which 6 parts by weight of solvent 3 (2,2,4-trimethyl-1,3-pentanediol monoisobutyrate with a solubility in water of 0.09 g/100 g), 80 parts by weight of

gel-forming material 1, and 2 parts by weight of antifoamer 1 were mixed, and the respective powders were further mixed to form each colorant. The types and contents of the powders and the contrast ratio of the colorant are shown in Table 2.

5 [0103]

[Table 2]

		Color	Content (wt%) in colorant					Contrast ratio
			Yellow powder 1	Red powder 1	Black powder 1	Achromatic color powder 1	Achromatic color powder 2	
Colorant	B1 C1 D1 E1 F1	Gray	0.07	0.01	0.24	0.30	5.95	46%
	B2 C2 D2 E2 F2	Dark gray	0.03	-	0.35	0.14	5.95	36%
	B3 C3 D3 E3 F3	Red brown	0.12	0.09	0.13	0.11	6.30	35%
	B4 C4 D4 E4 F4	Black	0.06	-	0.54	-	5.60	40%

[0104]

Production Example G (Production of Colorants G1 to G4)

Production Example H (Production of Colorants H1 to H4)

10 Production Example I (Production of Colorants I1 to I4)

A vessel was charged with 100 parts by weight of acrylic resin emulsion 1, into which 6 parts by weight of solvent 3 (2,2,4-trimethyl-1,3-pentanediol monoisobutyrate with a solubility in water of 0.09 g/100 g), 80 parts by weight of
 15 gel-forming material 1, and 2 parts by weight of antifoamer 1

were mixed, and the respective powders were further mixed to form each colorant. The types and contents of the powders and the contrast ratio of the colorant are shown in Table 3.

[0105]

5 Production Example J (Production of Colorants J1 to J4)

A vessel was charged with 100 parts by weight of acrylic resin emulsion 1, into which 13 parts by weight of solvent 2 (2,2,4-trimethyl-1,3-pentanediol diisobutyrate with a solubility in water of 0.04 g/100 g), 80 parts by weight of
10 gel-forming material 1, and 2 parts by weight of antifoamer 1 were mixed, and the respective powders were further mixed to form each colorant. The types and contents of the powders and the contrast ratio of the colorant are shown in Table 3.

[0106]

15 Production Example K (Production of Colorants K1 to K4)

A vessel was charged with 100 parts by weight of acrylic resin emulsion 1, into which 3 parts by weight of solvent 2 (2,2,4-trimethyl-1,3-pentanediol diisobutyrate with a solubility in water of 0.04 g/100 g), 80 parts by weight of
20 gel-forming material 1, and 2 parts by weight of antifoamer 1 were mixed, and the respective powders were further mixed to form each colorant. The types and contents of the powders and the contrast ratio of the colorant are shown in Table 3.

[0107]

25 [Table 3]

		Color	Content (wt%) in colorant					Contrast ratio
			Yellow powder 1	Red powder 1	Black powder 1	Achromatic color powder 1	Achromatic color powder 3	
Colorant	G1 H1 I1 J1 K1	Gray	0.08	0.01	0.28	0.35	5.85	47%
	G2 H2 I2 J2 K2	Dark gray	0.04	-	0.41	0.16	5.85	38%
	G3 H3 I3 J3 K3	Red brown	0.14	0.10	0.15	0.13	6.21	35%
	G4 H4 I4 J4 K4	Black	0.07	-	0.65	-	5.45	41%

[0108]

Production Example L (Production of Colorants L1 to L4)

A vessel was charged with 100 parts by weight of acrylic resin emulsion 1, into which 6 parts by weight of solvent 3 (2,2,4-trimethyl-1,3-pentanediol monoisobutyrate with a solubility in water of 0.09 g/100 g), 80 parts by weight of gel-forming material 1, and 2 parts by weight of antifoamer 1 were mixed, and the respective powders were further mixed to form each colorant. The types and contents of the powders and the contrast ratio of the colorant are shown in Table 4.

[0109]

[Table 4]

		Color	Content (wt%) in colorant					Contrast ratio
			Yellow powder 1	Red powder 1	Black powder 1	Achromatic color powder 1	Achromatic color powder 3	
Colorant	L1	Gray	0.07	0.01	0.24	0.26	9.04	47%
	L2	Dark gray	0.03	-	0.35	0.12	9.04	38%
	L3	Red brown	0.12	0.09	0.13	0.10	9.52	36%
	L4	Black	0.06	-	0.54	-	8.55	42%

[0110]

Production Example M (Production of Colorants M1 to M4)

Each colorant was produced using the same process as in
 5 Production Example L, except that the types and contents of the
 powders were changed as shown in Table 5.

[0111]

[Table 5]

		Color	Content (wt%) in colorant					Contrast ratio
			Yellow powder 1	Red powder 1	Black powder 1	Achromatic color powder 1	Achromatic color powder 3	
Colorant	M1	Gray	0.07	0.01	0.24	0.32	2.92	46%
	M2	Dark gray	0.03	-	0.35	0.15	2.92	37%
	M3	Red brown	0.12	0.09	0.13	0.12	3.16	36%
	M4	Black	0.06	-	0.54	-	2.50	40%

[0112]

10 Production Example N (Production of Colorants N1 to N4)

Each colorant was produced using the same process as in
 Production Example L, except that the types and contents of the
 powders were changed as shown in Table 6.

[0113]

15

[Table 6]

		Color	Content (wt%) in colorant					Contrast ratio
			Yellow powder 1	Red powder 1	Black powder 1	Achromatic color powder 1	Achromatic color powder 3	
Colorant	N1	Gray	0.07	0.01	0.24	0.21	26.2	53%
	N2	Dark gray	0.03	-	0.35	0.08	26.2	42%
	N3	Red brown	0.12	0.09	0.13	0.06	28.0	40%
	N4	Black	0.06	-	0.54	-	25.3	46%

[0114]

Production Example O (Production of Colorants O1 to O4)

Each colorant was produced using the same process as in
 5 Production Example L, except that the types and contents of the powders were changed as shown in Table 7.

[0115]

[Table 7]

		Color	Content (wt%) in colorant					Contrast ratio
			Yellow powder 1	Red powder 1	Black powder 1	Achromatic color powder 1	Achromatic color powder 3	
Colorant	O1	Gray	0.07	0.01	0.24	0.35	0.85	47%
	O2	Dark gray	0.03	-	0.35	0.16	0.85	37%
	O3	Red brown	0.12	0.09	0.13	0.13	0.92	37%
	O4	Black	0.06	-	0.54	-	0.77	39%

[0116]

10 Production Example P (Production of Colorants P1 to P4)

Each colorant was produced using the same process as in
 Production Example L, except that the types and contents of the powders were changed as shown in Table 8.

[0117]

15 Production Example Q (Production of Colorants Q1 to Q4)

Each colorant was produced using the same process as in
 Production Example B, except that the types and contents of the

powders were changed as shown in Table 8.

[0118]

Production Example R (Production of Colorants R1 to R4)

Each colorant was produced using the same process as in
5 Production Example A, except that the types and contents of the
powders were changed as shown in Table 8.

[0119]

[Table 8]

		Color	Content (wt%) in colorant				Contrast ratio
			Yellow powder 1	Red powder 1	Black powder 1	Achromatic color powder 1	
Colorant	P1 Q1 R1	Gray	0.07	0.01	0.24	0.38	48%
	P2 Q2 R2	Dark gray	0.03	-	0.35	0.18	39%
	P3 Q3 R3	Red brown	0.12	0.09	0.13	0.14	37%
	P4 Q4 R4	Black	0.06	-	0.54	-	39%

[0120]

10 Production Example S (Production of Colorants S1 to S4)

Each colorant was produced using the same process as in
Production Example A, except that the types and contents of the
powders were changed as shown in Table 9.

[0121]

15

[Table 9]

		Color	Content (wt%) in colorant				Contrast ratio
			Yellow powder 1	Red powder 1	Black powder 1	Achromatic color powder 1	
Colorant	S1	Gray	0.07	0.01	0.20	0.38	49%
	S2	Dark gray	0.03	-	0.28	0.18	40%
	S3	Red brown	0.12	0.09	0.10	0.14	38%
	S4	Black	0.06	-	0.42	-	44%

[0122]

Production Example T (Production of Colorants T1 to T6)

Each colorant was produced using the same process as in
 5 Production Example A, except that the types and contents of the
 powders were changed as shown in Table 10.

[0123]

[Table 10]

		Color	Content (wt%) in colorant				Contrast ratio
			Yellow powder 1	Red powder 1	Black powder 1	Achromatic color powder 1	
Colorant	T1	Gray	0.58	0.10	1.88	3.05	100%
	T2	Dark gray	0.22	-	2.35	1.25	100%
	T3	Red brown	1.21	0.94	1.28	1.35	100%
	T4	Black	0.30	-	2.75	-	100%
	T5	Light gray	-	-	0.30	6.05	100%
	T6	Light yellow	0.50	-	-	6.05	100%

[0124]

10 (Production of Aqueous Medium)

Production of Aqueous Medium 1

A vessel was charged with 75 parts by weight of acrylic resin emulsion 1 (40% by weight solid and 60% by weight water), into which 4 parts by weight of solvent 1 (propylene glycol
 15 monobutyl ether with a solubility in water of 6.0 g/100 g), 10 parts by weight of water, 10 parts by weight of gelling agent 1 (an aqueous 5% by weight ammonium borate solution), and 1 part

by weight of antifoamer 1 were uniformly mixed to form aqueous medium 1.

[0125]

Production of Aqueous Medium 2

5 A vessel was charged with 75 parts by weight of acrylic resin emulsion 1, into which 4 parts by weight of solvent 2 (2,2,4-trimethyl-1,3-pentanediol diisobutyrate with a solubility in water of 0.04 g/100 g), 10 parts by weight of water, 10 parts by weight of gelling agent 1, and 1 part by weight of
10 antifoamer 1 were uniformly mixed to form aqueous medium 2.

[0126]

Production of Aqueous Medium 3

A vessel was charged with 75 parts by weight of acrylic resin emulsion 1, into which 12 parts by weight of solvent 2,
15 2 parts by weight of water, 10 parts by weight of gelling agent 1, and 1 part by weight of antifoamer 1 were uniformly mixed to form aqueous medium 3.

[0127]

Production of Aqueous Medium 4

20 A vessel was charged with 75 parts by weight of acrylic resin emulsion 1, into which 2 parts by weight of solvent 2, 12 parts by weight of water, 10 parts by weight of gelling agent 1, and 1 part by weight of antifoamer 1 were uniformly mixed to form aqueous medium 4.

25 [0128]

Production of Aqueous Medium 5

A vessel was charged with 75 parts by weight of acrylic resin emulsion 1, into which 4 parts by weight of solvent 3 (2,2,4-trimethyl-1,3-pentanediol monoisobutyrate with a solubility in water of 0.09 g/100 g), 10 parts by weight of water, 10 parts by weight of gelling agent 1, and 1 part by weight of antifoamer 1 were uniformly mixed to form aqueous medium 5. [0129]

(Production of Dispersion)

10 Production of Dispersion A1

Colorant A1 was added to aqueous medium 1 in a ratio of 1:2 and stirred and dispersed to form dispersion A1 containing coloring granules with particle sizes of about 3 to about 8 mm. [0130]

15 Production of Dispersions A2 to T6

Each dispersion was produced using the same process as for dispersion A1, except that the combination of the aqueous medium and the colorant was changed as shown in Table 11. Accordingly, dispersions (dispersions A2 to T6) were obtained from colorants A2 to T6, respectively. [0131]

(Production of Coating Material)

Production of Coating Material AA

Dispersions A1, A2, A3, and A4 were mixed in equal amounts to form coating material AA. 25

[0132]

Production of Coating Materials BA to TA

Dispersions were used in each combination shown in Table 11 and mixed in equal amounts, so that coating materials BA to
5 TA were obtained.

[0133]

Production of Coating Material AB and Coating Material TB

Dispersions A1, A5, and A6 were mixed in equal amounts
10 to form coating material AB.

Dispersions T1, T5, and T6 were mixed in equal amounts to form coating material TB.

[0134]

[Table 11]

Formulation	Dispersion		Mixed dispersions
	Colorants	Aqueous medium	
Coating material AA	A1, A2, A3, A4	1	A1, A2, A3, A4
Coating material BA	B1, B2, B3, B4	1	B1, B2, B3, B4
Coating material CA	C1, C2, C3, C4	2	C1, C2, C3, C4
Coating material DA	D1, D2, D3, D4	5	D1, D2, D3, D4
Coating material EA	E1, E2, E3, E4	2	E1, E2, E3, E4
Coating material FA	F1, F2, F3, F4	5	F1, F2, F3, F4
Coating material GA	G1, G2, G3, G4	2	G1, G2, G3, G4
Coating material HA	H1, H2, H3, H4	3	H1, H2, H3, H4
Coating material IA	I1, I2, I3, I4	4	I1, I2, I3, I4
Coating material JA	J1, J2, J3, J4	5	J1, J2, J3, J4
Coating material KA	K1, K2, K3, K4	5	K1, K2, K3, K4
Coating material LA	L1, L2, L3, L4	2	L1, L2, L3, L4
Coating material MA	M1, M2, M3, M4	2	M1, M2, M3, M4
Coating material NA	N1, N2, N3, N4	2	N1, N2, N3, N4
Coating material OA	O1, O2, O3, O4	2	O1, O2, O3, O4
Coating material PA	P1, P2, P3, P4	2	P1, P2, P3, P4
Coating material QA	Q1, Q2, Q3, Q4	1	Q1, Q2, Q3, Q4
Coating material RA	R1, R2, R3, R4	1	R1, R2, R3, R4
Coating material SA	S1, S2, S3, S4	1	S1, S2, S3, S4
Coating material TA	T1, T2, T3, T4	1	T1, T2, T3, T4
Coating material AB	A1, A5, A6	1	A1, A5, A6
Coating material TB	T1, T5, T6	1	T1, T5, T6

[0135]

(Test Example 1)

Test Example 1-1

Each of coating materials AA and TA was applied in an
5 amount of 0.6 kg/m^2 by spray coating to a slate plate (150 x
70 mm) coated with a gray undercoating material and dried under
the standard conditions for 24 hours. The dry thickness of the
coating at bump parts was about $900 \text{ }\mu\text{m}$.

Each test plate obtained by this process was observed for
10 appearance and evaluated for aesthetics (transparency, a sense
of depth, and other appearance features). As a result, coating
material AA was far superior in aesthetics.

[0136]

Test Example 1-2

15 Using each of coating materials AB and TB, a test plate
was prepared by the same process as in Test Example 1-1, and
the resulting coating (the dry thickness of the coating at bump
parts was about $900 \text{ }\mu\text{m}$) was evaluated for aesthetics. As a
result, coating material AB was far superior in aesthetics.

20 [0137]

Test Example 1-3

Using each of coating materials AA to SA, a test plate
was prepared by the same process as in Test Example 1-1 and
evaluated for aesthetics. As a result, all plates had good
25 esthetics, in which coating materials AA to MA were particularly

good.

[0138]

Test Example 1-4

Next, coating materials AA to SA were subjected to the
5 tests described below. Table 12 shows the test results.
Coating materials TA, AB, and TB were not evaluated.

[0139]

(Storage Stability)

After the aesthetic evaluation, each coating material was
10 hermetically sealed in a vessel and stored in a 50°C environment
for 7 days. Using the stored material, a test plate was prepared
again by the same process. Using this method, it was observed
whether the aesthetics changed before and after the storage.
The evaluation was performed on a scale of three levels (A>B>C),
15 in which no change in aesthetics was rated "A", and a significant
change in aesthetics was rated "C".

[0140]

(Water Resistance 1)

Each coating material was applied by the same process as
20 in Test Example 1-1, and then the resulting test plate was dried
in a 5°C environment for 24 hours. Subsequently, the test plate
was immersed in water for 90 minutes and then observed for the
appearance of the coating. The evaluation was performed on a
scale of three levels (A>B>C), in which no abnormalities
25 observed in the coating were rated "A", and significant

abnormalities observed in the coating were rated "C".

[0141]

(Water Resistance 2)

Each coating material was applied by the same process as
5 in Test Example 1-1, and then the resulting test plate was dried
in a 5°C environment for 6 hours. Subsequently, the test plate
was immersed in water for 90 minutes and then observed for the
appearance of the coating. The evaluation was performed on a
scale of three levels (A>B>C), in which no abnormalities
10 observed in the coating were rated "A", and significant
abnormalities observed in the coating were rated "C". Coating
materials AA, QA, RA, and SA, which were rated B or C in the
evaluation of water resistance 1, were not subjected to this
evaluation.

15 [0142]

(Temperature Rise-Suppressing Ability)

Each coating material was applied by the same process as
in Test Example 1-1, and then the resulting test plate was aged
under the standard conditions for 14 days. Subsequently, the
20 coating surface of the test plate was irradiated from a distance
of 25 cm with an infrared lamp (250 W power) while the temperature
of the surface of the test plate was measured. In the evaluation,
a resulting temperature of less than 60°C was rated "A", a
resulting temperature of 60°C to less than 65°C was rated "B",
25 and a resulting temperature of 65°C or higher was rated "C".

[0143]

[Table 12]

Test results	Storage stability	Water resistance 1	Water resistance 2	Temperature rise-suppressing ability
Coating material AA	A	B	-	A
Coating material BA	A	A	B	A
Coating material CA	A	A	A	A
Coating material DA	A	A	A	A
Coating material EA	A	A	A	A
Coating material FA	A	A	B	A
Coating material GA	A	A	A	A
Coating material HA	A	A	A	A
Coating material IA	A	A	A	A
Coating material JA	A	A	A	A
Coating material KA	A	A	A	A
Coating material LA	A	A	A	A
Coating material MA	A	A	A	A
Coating material NA	A	A	B	A
Coating material OA	A	A	B	B
Coating material PA	A	A	B	B
Coating material QA	A	B	-	B
Coating material RA	A	C	-	B
Coating material SA	C	C	-	C

Note: Hyphens in the table mean no evaluation executed.

[0144]

5 (Test Example 2)

Test Example 2-1

Coating materials AA, BA, RA, SA, and TA were applied to

a slate plate (150 x 70 mm) coated with a gray-colored undercoating material to form test plates A, B, R, S, and T, respectively. Coating material AA was applied to a slate plate coated with a white-colored undercoating material to form test plate A'. In the preparation of each test plate, the coating material was applied by spraying (the amount of application: 0.6 kg/m²) and dried under the standard conditions for 24 hours. The dry thickness of each coating at bump parts was about 900 μ m.

10 Test plates A, B, R, and S each contained transparent coloring granules having the same color ($\Delta E \leq 3$) as that of the colored undercoating material layer. In test plate T, all coloring granules in the coating material were opaque. In test plate A', all coloring granules in the coating material were
15 different in color ($\Delta E > 5$) from the colored undercoating material layer.

The test plates obtained by this process were observed for appearance and evaluated for aesthetics (transparency, a sense of depth, pattern enlarging effect, and other appearance
20 features). As a result, test plates A, B, R, and S had good aesthetics, and especially, test plates A and B were the best.
[0145]

(Test Example 3)

Test Example 3-1

25 Coating materials AA and TA were applied to a slate plate

(150 x 70 mm) coated with a black infrared-reflective undercoating material (containing acrylic resin and iron-chromium complex oxide) to form test plates AA and TA, respectively. Coating material AA was applied to a slate plate
5 (150 x 70 mm) coated with a black infrared-absorbing undercoating material (containing acrylic resin and carbon black) to form test plate AA'. In the preparation of each test plate, the coating material was applied by spraying (the amount of application: 0.6 kg/m^2) and dried under the standard
10 conditions for 24 hours. The dry thickness of each coating at bump parts was about $900 \text{ }\mu\text{m}$.

Test plates AA and AA' each contained transparent coloring granules having the same color ($\Delta E \leq 3$) as that of the colored undercoating material layer. In test plate TA, all
15 coloring granules in the coating material were opaque.

The test plates obtained by this process were observed for appearance and evaluated for aesthetics (transparency, a sense of depth, pattern enlarging effect, and other appearance features). As a result, test plates AA and AA' were superior.

20 Subsequently, test plates AA and AA' were aged under the standard conditions for 14 days, and then the coating surface of each test plate was irradiated from a distance of 25 cm with an infrared lamp (250 W power) while the temperature of the surface of the test plate was measured. As a result, test plate
25 AA exhibited a temperature of lower than 60°C , and test plate

AA' exhibited a temperature of 65°C or higher.

[0146]

Test Example 3-2

Coating materials AB and TB were applied to a slate plate
5 (150 x 70 mm) coated with a gray infrared-reflective
undercoating material (containing acrylic resin, titanium
oxide, and iron-chromium complex oxide) to form test plates AB
and TB, respectively. The test plates were prepared under the
same conditions of application as in Test Example 3-1.

10 Test plate AB contained transparent coloring granules
having the same color ($\Delta E \leq 3$) as that of the colored undercoating
material layer. In test plate TB, all coloring granules in the
coating material were opaque.

The test plates obtained by this process were observed
15 for appearance and evaluated for aesthetics. As a result, test
plate AB was superior.

[0147]

Test Example 3-3

Coating material AA and achromatic color powder 4 were
20 mixed in a weight ratio of 85:15 to form coating material VA.
Coating material BA and achromatic color powder 4 were mixed
in a weight ratio of 85:15 to form coating material WA. Coating
material QA and achromatic color powder 4 were mixed in a weight
ratio of 85:15 to form coating material XA.

25 [0148]

Each of coating materials BA to SA, VA, WA, and XA was used in place of coating material AA for test plate AA to form each of test plates (test plates BA to SA, VA, WA, and XA).

The test plates obtained by this process were observed
5 for appearance and evaluated for aesthetics. As a result, all had good aesthetics, in which coating materials AA to MA, VA, WA, and XA were particularly good.

[0149]

Test Example 3-4

10 Next, each test was performed in the same manner as in Test Example 1-4. Table 13 shows the test results.

[0150]

[Table 13]

Test results	Storage stability	Water resistance 1	Water resistance 2	Temperature rise-suppressing ability
Coating material AA	A	B	-	A
Coating material BA	A	A	B	A
Coating material CA	A	A	A	A
Coating material DA	A	A	A	A
Coating material EA	A	A	A	A
Coating material FA	A	A	B	A
Coating material GA	A	A	A	A
Coating material HA	A	A	A	A
Coating material IA	A	A	A	A
Coating material JA	A	A	A	A
Coating material KA	A	A	A	A
Coating material LA	A	A	A	A
Coating material MA	A	A	A	A
Coating material NA	A	A	B	A
Coating material OA	A	A	B	B
Coating material PA	A	A	B	B
Coating material QA	A	B	-	B
Coating material RA	A	C	-	B
Coating material SA	C	C	-	C
Coating material VA	A	A	-	A
Coating material WA	A	A	A	A
Coating material XA	A	A	-	A

Note: Hyphens in the table mean no evaluation executed.

DESCRIPTION OF REFERENCE SIGNS

[0151]

- 1: Base material
- 2: Colored undercoating material layer
- 3: Coating material layer
- 31, 32, 33: Transparent coloring granules
- 5
- 5: Support layer
- 6: Adhesive layer

CLAIMS

1. A coating material, comprising:
two or more types of coloring granules having
5 different colors,
wherein at least one type of the coloring granules are
transparent coloring granules containing a water-borne
resin and chromatic color particles or black particles or
both,
10 the transparent coloring granules are a granulated
transparent colorant,
the transparent colorant forms a transparent colored
coating with a contrast ratio of 80% or less, and
the transparent colorant contains a hydrophobic
15 solvent, and
solubility in water (at 20°C) of the hydrophobic
solvent is 5 g/100 g or less.
2. The coating material according to claim 1, wherein
20 at least one type of the coloring granules are transparent
coloring granules further containing achromatic color
particles (exclusive of black particles) with an average
particle size of 0.4 μm or more to 500 μm or less and a
refractive index of 1.4 to 2.0.
25
3. The coating material according to claim 1 or 2,
wherein the two or more types of coloring granules having
different colors are dispersed in an aqueous medium.

4. A coating material layer formed by the coating material according to any one of claims 1 to 3.

5. A laminated structure, comprising:
5 the coating material layer according to claim 4 formed on a colored undercoating material layer.

6. The laminated structure according to claim 5, wherein the colored undercoating material layer has
10 infrared reflecting properties.

7. The laminated structure according to claim 5, wherein at least one type of transparent coloring granules contained in the coating material layer have the same color
15 as that of the colored undercoating material layer,

the same color being recognized as visually almost the same color and having mutual color difference of 5 or less, and the color difference (ΔE) being calculated by measuring color data (L^* , a^* , b^*) of the objects (the surface part of
20 the colored undercoating material layer and the transparent coloring granules-containing part on the colored undercoating material layer) and being measured by using a color-difference meter.

25 8. The laminated structure according to claim 5, wherein in the coating material layer has a dry thickness of 50 μm to 2,000 μm at its bump part.

9. The coating material according to claim 1, wherein a ratio of the hydrophobic solvent to the transparent colorant is 0.5 wt% to 15 wt%.