Claims:

[Claim 1]

A coating composition comprising:

(A) a fine particulate composite metal oxide;

(B') a hydrolyzed product of a hydrolyzable organosilicon compound containing an organosilicon compound (B1) that has an epoxy group and a hydrolyzable group;

(C) water;

(D) a water-soluble organic solvent; and

(E) a curing catalyst;

wherein said water-soluble organic solvent (D) is a solvent that contains (D1) a low-boiling lowly viscous alcohol having not more than 3 carbon atoms, (D2) a low-boiling highly viscous alcohol selected from the group consisting of t-butanol, n-butanol and 2-butanol, and (D3) a high-boiling organic solvent having a boiling point of 150℃ to 200℃;

said low-boiling lowly viscous alcohol (D1) being contained in such an amount that the mass ratio (D1/C) thereof to said water (C) is in a range of 1.80 to 7.00;

said low-boiling highly viscous alcohol (D2) being contained in such an amount that the mass ratio (D2/C) thereof to said water (C) is 0.24 to 2.50; and

said high-boiling organic solvent (D3) being contained in such an amount that the mass ratio (D3/C) thereof to said water (C) is 1.10 to 4.40.

[Claim 2]

The coating composition according to claim 1, wherein said low-boiling highly viscous alcohol (D2) is a t-butyl alcohol and said high-boiling organic solvent (D3) is a diacetone alcohol.

[Claim 3]

The coating composition according to claim 1, wherein said fine particulate composite oxide (A) is contained in an amount of 25.0 to 70.0 parts by mass, said water (C) is contained in an amount of 5.0 to 65.0 parts by mass, and said curing catalyst (E) is contained in an amount of 1.0 to 5.0 parts by

mass per 100 parts by mass of the total amount of said fine particulate composite oxide (A) and said hydrolyzed product (B').

[Claim 4]

A process for producing a coating composition by providing:

(A) a fine particulate composite metal oxide;

(B) a hydrolyzable organosilicon compound containing an organosilicon compound (B1) that has an epoxy group and a hydrolyzable group;

(C) water;

(D) a water-soluble organic solvent; and

(E) a curing catalyst;

and forming a hydrolyzed product (B') of said hydrolyzable organosilicon compound (B) in a step of mixing said components;

wherein (D1) a low-boiling lowly viscous alcohol having not more than 3 carbon atoms, (D2) a low-boiling highly viscous alcohol selected from the group consisting of t-butanol, n-butanol and 2-butanol, and (D3) a high-boiling organic solvent having a boiling point of 150℃ to 200℃, are used in combination as said water-soluble organic solvent (D); and

the components (A), (B), (C), (D) and (E) are used in such amounts that per 100 parts by mass of the total amount of said fine particulate composite oxide (A) and said hydrolizable organosilicon compound (B):

said fine particulate composite oxide (A) is fed in an amount of 20.0 parts by mass to 60.0 parts by mass, said water (C) is fed in an amount of 20.0 to 70.0 parts by mass, and said curing catalyst (E) is fed in an amount of 0.9 to 5.0 parts by mass;

the feeding mass ratio (D1/C) of said low-boiling lowly viscous alcohol (D1) to said water (C) being 0.55 to 3.00;

the feeding mass ratio (D2/C) of said low-boiling highly viscous alcohol (D2) to said water (C) being 0.18 to 1.80; and

the feeding mass ratio (D3/C) of said high-boiling organic solvent (D3) to said water (C) being 0.70 to 2.70.

[Claim 5]

The process for producing a coating composition according to claim 4, wherein a t-butyl alcohol is used as said low-boiling highly viscous alcohol (D2) and a diacetone alcohol is used as said high-boiling organic solvent (D3).

[Claim 6]

The process for producing a coating composition according to claim 4, wherein said hydrolyzable organosilicon compound (B) is hydrolyzed in the absence of said fine particulate composite metal oxide (A), and said fine particulate composite metal oxide (A) is mixed after the hydrolyzed product (B') of said hydrolyzable organosilicon compound (B) has been formed.

[Claim 7]

The process for producing a coating composition according to claim 4, wherein said hydrolyzable organosilicon compound (B), further, contains an organosilicon compound (B2) having not less than 4 hydrolyzable groups in the molecules thereof, and the organosilicon compound (B1) having an epoxy group and a hydrolyzable group and said organosilicon compound (B2) are fed at a mass ratio (B1/B2) of 0.30 to 10.00.

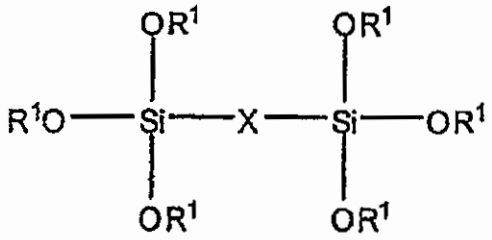
[Claim 8]

The process for producing a coating composition according to claim 7, wherein a tetraalkoxysilane is used as said organosilicon compound (B2) having not less than 4 hydrolyzable groups in the molecules thereof.

[Claim 9]

The process for producing a coating composition according to claim 7, wherein a disilane compound represented by the following formula (1),

[Chemical 1]



(1)

wherein $R^1$ is a methyl group or an ethyl group, and X is an alkylene group having 2 to 3 carbon atoms,

is used as said organosilicon compound (B2) having not less than 4 hydrolyzable groups in the molecules thereof.

[Claim 10]

A laminate in which a hard coat layer obtained by curing the coating composition of claim 1 is formed on the surface of a resin substrate.

[Claim 11]

The laminate according to claim 10, wherein said resin substrate is a photochromic optical substrate.

[Claim 12]

The laminate according to claim 11, wherein said photochromic optical substrate has, on the surface thereof, a photochromic coat layer obtained by curing the curable composition that contains a photochromic compound, and said hard coat layer is formed on said photochromic coat layer.

Claims:

[Claim 1]

A coating composition comprising:

(A) a fine particulate composite metal oxide of at least two or more kinds of metal oxides which are bonded together on a molecular level or a fine particulate composite metal oxide of a composite layer structure having laminated thereon another fine particulate metal oxide with the fine particulate composite metal oxide as nuclei;

(B') a hydrolyzed product of a hydrolyzable organosilicon compound containing an organosilicon compound (B1) that has an epoxy group and a hydrolyzable group;

(C) water;

(D) a water-soluble organic solvent; and

(E) a curing catalyst for the hydrolyzed product of said hydrolysable organosilicon compound of at least one of those selected from the group consisting of an acetyl acetonato complex, perchlorates, an organic metal salt and Lewis acid;

wherein said water-soluble organic solvent (D) is a solvent that contains (D1) a low-boiling lowly viscous alcohol having not more than 3 carbon atoms, (D2) a low-boiling highly viscous alcohol selected from the group consisting of t-butanol, n-butanol and 2-butanol, and (D3) a high-boiling organic solvent having a boiling point of 150°C to 200°C;

said low-boiling lowly viscous alcohol (D1) being contained in such an amount that the mass ratio (D1/C) thereof to said water (C) is in a range of 1.80 to 7.00;

said low-boiling highly viscous alcohol (D2) being contained in such an amount that the mass ratio (D2/C) thereof to said water (C) is 0.24 to 2.50; and

said high-boiling organic solvent (D3) being contained in such an amount that the mass ratio (D3/C) thereof to said water (C) is 1.10 to 4.40.

[Claim 2]

The coating composition according to claim 1, wherein said low-boiling highly viscous alcohol (D2) is a t-butyl alcohol and said high-boiling organic solvent (D3) is a diacetone alcohol.

[Claim 3]

The coating composition according to claim 1, wherein said fine particulate composite oxide (A) is contained in an amount of 25.0 to 70.0 parts by mass, said water (C) is contained in an amount of 5.0 to 65.0 parts by mass, and said curing catalyst (E) is contained in an amount of 1.0 to 5.0 parts by mass per 100 parts by mass of the total amount of said fine particulate composite oxide (A) and said hydrolyzed product (B').

[Claim 4]

A process for producing a coating composition by providing:

(A) a fine particulate composite metal oxide of at least two or more kinds of metal oxides which are bonded together on a molecular level or a fine particulate composite metal oxide of a composite layer structure having laminated thereon another fine particulate metal oxide with the fine particulate composite metal oxide as nuclei;

(B) a hydrolyzable organosilicon compound containing an organosilicon compound (B1) that has an epoxy group and a hydrolyzable group;

(C) water;

(D) a water-soluble organic solvent; and

(E) a curing catalyst for the hydrolyzed product of said hydrolysable organosilicon compound of at least one of those selected from the group consisting of an acetyl acetonato complex, perchlorates, an organic metal salt and Lewis acid; and forming a hydrolyzed product (B') of said hydrolyzable organosilicon compound (B) in a step of mixing said components;

wherein (D1) a low-boiling lowly viscous alcohol having not more than 3 carbon atoms, (D2) a low-boiling highly viscous

alcohol selected from the group consisting of t-butanol, n-butanol and 2-butanol, and (D3) a high-boiling organic solvent having a boiling point of 150°C to 200°C, are used in combination as said water-soluble organic solvent (D); and

the components (A), (B), (C), (D) and (E) are used in such amounts that per 100 parts by mass of the total amount of said fine particulate composite oxide (A) and said hydrolizable organosilicon compound (B):

said fine particulate composite oxide (A) is fed in an amount of 20.0 parts by mass to 60.0 parts by mass, said water (C) is fed in an amount of 20.0 to 70.0 parts by mass, and said curing catalyst (E) is fed in an amount of 0.9 to 5.0 parts by mass;

the feeding mass ratio (D1/C) of said low-boiling lowly viscous alcohol (D1) to said water (C) being 0.55 to 3.00;

the feeding mass ratio (D2/C) of said low-boiling highly viscous alcohol (D2) to said water (C) being 0.18 to 1.80; and

the feeding mass ratio (D3/C) of said high-boiling organic solvent (D3) to said water (C) being 0.70 to 2.70.

[Claim 5]

The process for producing a coating composition according to claim 4, wherein a t-butyl alcohol is used as said low-boiling highly viscous alcohol (D2) and a diacetone alcohol is used as said high-boiling organic solvent (D3).

[Claim 6]

The process for producing a coating composition according to claim 4, wherein said hydrolyzable organosilicon compound (B) is hydrolyzed in the absence of said fine particulate composite metal oxide (A), and said fine particulate composite metal oxide (A) is mixed after the hydrolyzed product (B') of said hydrolyzable organosilicon compound (B) has been formed.

[Claim 7]

The process for producing a coating composition according to claim 4, wherein said hydrolyzable organosilicon compound (B), further, contains an organosilicon compound (B2) having not less than 4 hydrolyzable groups in the molecules thereof,

and the organosilicon compound (B1) having an epoxy group and a hydrolyzable group and said organosilicon compound (B2) are fed at a mass ratio (B1/B2) of 0.30 to 10.00.

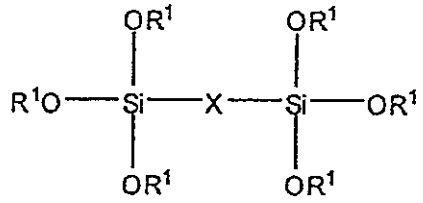
[Claim 8]

The process for producing a coating composition according to claim 7, wherein a tetraalkoxysilane is used as said organosilicon compound (B2) having not less than 4 hydrolyzable groups in the molecules thereof.

[Claim 9]

The process for producing a coating composition according to claim 7, wherein a disilane compound represented by the following formula (1),

[Chemical 1]



(1)

wherein $R^1$ is a methyl group or an ethyl group, and X is an alkylene group having 2 to 3 carbon atoms,

is used as said organosilicon compound (B2) having not less than 4 hydrolyzable groups in the molecules thereof.

[Claim 10]

A laminate in which a hard coat layer obtained by curing the coating composition of claim 1 is formed on the surface of a resin substrate.

[Claim 11]

The laminate according to claim 10, wherein said resin substrate is a photochromic optical substrate.

[Claim 12]

The laminate according to claim 11, wherein said photochromic optical substrate has, on the surface thereof, a photochromic coat layer obtained by curing the curable composition that contains a photochromic compound, and said hard coat layer is formed on said photochromic coat layer.