appearance properties and adhesion and for such conventional coating compositions to exhibit satisfactory storage stability, and thus the respective properties have been under trade-off relationship among one another.

[0020]

In view of the failure to overcome the problems by such conventional antifouling coating compositions containing triisopropylsilyl(meth)acrylate polymers, the present inventors found that by allowing a copolymer of triisopropylsilyl methacrylate and triisopropylsilyl acrylate to have specific ratios of structural units derived from respective monomers, it is possible for an antifouling coating composition to have good long-term storage stability, and for a coating film formed from said coating composition to have good long-term antifouling properties and long-term water resistance, with good balance.

[0021]

That is, it is an object of the embodiments disclosed herein to provide an antifouling coating composition that is excellent in long-term storage stability and gives a coating film excellent in long-term antifouling properties and long-term water resistance.

[0021a]

In a first aspect, there is provided a silylacrylic copolymer for use a binder component of an antifouling coating composition, the ~~comprising a~~ silylacrylic copolymer ~~(A) that~~

~~comprises~~ comprising a structural unit (1) derived from triisopropylsilyl methacrylate (i), a monomer structural unit (2) derived from triisopropylsilyl acrylate (ii) and a structural unit (3) derived from a polymerizable monomer having a polymerizable double bond (iii), which excludes the above (i) and (ii), the silylacrylic copolymer satisfying ~~and satisfies~~ the following Requirements 1 and 2;

Requirement 1: the content weight ratio ([(1)+(2)]/(3)) of the total weight ((1)+(2)) of the structural unit (1) and the structural unit (2) to the content weight of the structural unit (3) is 50/50 to 90/10; and

Requirement 2: the content weight ratio ((1)/(2)) of the content weight of the structural unit (1) to the content weight of the structural unit (2) is ~~more than 50/50 and not more than~~ 60/40 to 95/5.

[0021b]

In a second aspect, there is provided an antifouling coating composition comprising the silylacrylic copolymer (A) as defined herein.

[0022]

It is another object of the present disclosure to provide an antifouling coating film and an antifouling substrate that are prepared by using the coating composition and being excellent in

long-term antifouling properties and long-term water resistance; and a method for producing an antifouling substrate excellent in long-term antifouling properties and long-term water resistance.

[0022a]

In a ~~second~~ third aspect, there is provided an antifouling coating film formed by curing the antifouling coating composition as defined above.

[0022b]

In a ~~third~~ fourth aspect, there is provided an antifouling substrate formed by coating or impregnating a substrate with the antifouling coating composition as defined above, and curing the coating composition, which is used to coat or impregnate the substrate, to thereby form an antifouling coating film on the substrate.

[0022c]

In a ~~fourth~~ fifth aspect, there is provided a method for producing an antifouling substrate, the method comprising coating or impregnating a substrate with the antifouling coating composition as defined above; and curing the coating composition, which is used to coat or impregnate the substrate, to thereby form an antifouling coating film on the substrate.

~~[0022d]~~

~~In a fifth aspect, there is provided a silylacrylic copolymer for use as a binder component of an antifouling coating~~

~~composition, the silylacrylic copolymer comprising a structural unit (1) derived from triisopropylsilyl methacrylate (i), a monomer structural unit (2) derived from triisopropylsilyl acrylate (ii) and a structural unit (3) derived from a polymerizable monomer having a polymerizable double bond (iii), which excludes the above (i) and (ii), the silylacrylic copolymer satisfying the following Requirements 1 and 2;~~

~~Requirement 1: the content weight ratio ([(1)+(2)]/(3)) of the total weight ((1)+(2)) of the structural unit (1) and the structural unit (2) to the content weight of the structural unit (3) is 50/50 to 90/10; and~~

~~Requirement 2: the content weight ratio ((1)/(2)) of the content weight of the structural unit (1) to the content weight of the structural unit (2) is more than 50/50 and not more than 95/5.~~

TECHNICAL SOLUTION

[0023]

The antifouling coating composition according to the present invention comprises a silylacrylic copolymer (A) that comprises a structural unit (1) derived from triisopropylsilyl methacrylate (i), a monomer structural unit (2) derived from triisopropylsilyl acrylate (ii) and a structural unit (3) derived from a polymerizable monomer having a polymerizable double bond

CLAIMS

~~1. An antifouling coating composition comprising a silylacrylic copolymer (A) that comprises a structural unit (1) derived from triisopropylsilyl methacrylate (i), a structural unit (2) derived from triisopropylsilyl acrylate (ii) and a structural unit (3) derived from a polymerizable monomer having a polymerizable double bond (iii), which excludes the above (i) and (ii), and satisfies the following Requirements 1 and 2;~~

~~Requirement 1: the content weight ratio ([(1)+(2)]/(3)) of the total weight ((1)+(2)) of the structural unit (1) and the structural unit (2) to the content weight of the structural unit (3) is 50/50 to 90/10; and~~

~~Requirement 2: the content weight ratio ((1)/(2)) of the content weight of the structural unit (1) to the content weight of the structural unit (2) is more than 50/50 and not more than 95/5.~~

1. A silylacrylic copolymer for use as a binder component of an antifouling coating composition, the silylacrylic copolymer comprising a structural unit (1) derived from triisopropylsilyl methacrylate (i), a monomer structural unit (2) derived from triisopropylsilyl acrylate (ii) and a structural unit (3) derived from a polymerizable monomer having a polymerizable double bond (iii), which excludes the above (i) and (ii), the silylacrylic

copolymer satisfying the following Requirements 1 and 2;

Requirement 1: the content weight ratio ([(1)+(2)]/(3)) of the total weight ((1)+(2)) of the structural unit (1) and the structural unit (2) to the content weight of the structural unit (3) is 50/50 to 90/10; and

Requirement 2: the content weight ratio ((1)/(2)) of the content weight of the structural unit (1) to the content weight of the structural unit (2) is 60/40 to 95/5.

2. The ~~antifouling coating composition~~silylacrylic copolymer according to Claim 1, wherein the polymerizable monomer (iii) is an ester having a polymerizable double bond, or a carboxylic acid having a polymerizable double bond.

3. An antifouling coating composition comprising the silylacrylic copolymer (A) as defined in claim 1 or 2.

~~3~~4. The antifouling coating composition according to

Claim ~~1 or 2~~3, further comprising a rosin and/or a monocarboxylic acid compound (B).

~~4~~5. The antifouling coating composition according to Claim ~~3~~4, wherein the content weight ratio (W_A/W_B) of the content weight (W_A) of the silylacrylic copolymer (A) to the content weight (W_B) of the rosins and/or monocarboxylic acid compound (B) is 99.9/0.1 to 30/70.

~~5~~6. The antifouling coating composition according to any one of Claims ~~1~~3 to ~~4~~5, further comprising at least one selected from the group consisting of a copper compound (C), an organic antifouling agent (D), other additive(s) (E) including a plasticizer (e1), an extender pigment (e2), a pigment dispersant (e3), a coloring pigment (e4), an anti-sagging agent (e5), an anti-settling agent (e6) and dehydrating agent (e7), and solvent (F).

~~6~~7. An antifouling coating film formed by curing the antifouling coating composition described in any one of Claims ~~1~~3 to ~~5~~6.

~~7~~8. An antifouling substrate formed by coating or impregnating a substrate with the antifouling coating composition

described in any one of Claims ~~1~~ 3 to ~~5~~6, and curing the coating composition, which is used to coat or impregnate the substrate, to thereby form an antifouling coating film on the substrate.

~~8~~9. The antifouling substrate according to Claim ~~7~~8, which contacts with seawater or fresh water.

~~9~~10. The antifouling substrate according to Claim ~~7~~ 8 or ~~8~~9, wherein the substrate is at least one selected from the group consisting of an underwater structure, a ship and a fishing gear.

~~10~~11. A method for producing an antifouling substrate, the method comprising coating or impregnating a substrate with the antifouling coating composition described in any one of Claims ~~1~~ 3 to ~~5~~6; and curing the coating composition, which is used to coat or impregnate the substrate, to thereby form an antifouling coating film on the substrate.

~~11. A silylacrylic copolymer for use as a binder component of an antifouling coating composition, the silylacrylic copolymer comprising a structural unit (1) derived from triisopropylsilyl methacrylate (i), a monomer structural unit (2) derived from triisopropylsilyl acrylate (ii) and a structural unit (3) derived from a polymerizable monomer having a polymerizable double bond~~

(iii), which excludes the above (i) and (ii), the silylacrylic copolymer satisfying the following Requirements 1 and 2;

Requirement 1: the content weight ratio ([(1)+(2)]/(3)) of the total weight ((1)+(2)) of the structural unit (1) and the structural unit (2) to the content weight of the structural unit (3) is 50/50 to90/10; and

Requirement 2: the content weight ratio ((1)/(2)) of the content weight of the structural unit (1) to the content weight of the structural unit (2) is more than 50/50 and not more than 95/5.

ANTIFOULING COATING COMPOSITION, ANTIFOULING COATING FILM AND ANTIFOULING SUBSTRATE, AND METHOD FOR PRODUCING ANTIFOULING SUBSTRATE

ABSTRACT

The antifouling coating composition according to the present invention includes a silylacrylic copolymer including a structural unit (1) derived from triisopropylsilyl methacrylate (i), a structural unit (2) derived from triisopropylsilyl acrylate (ii) and a structural unit (3) derived from a polymerizable monomer having a polymerizable double bond (iii), which excludes the above (i) and (ii), the silylacrylic copolymer satisfies specific requirements. Thus, an antifouling coating composition that is excellent in long-term storage stability and gives a coating film excellent in long-term antifouling properties and long-term water resistance can be provided.

(No Suitable Figure)