CLAIMS

[Claim 1]

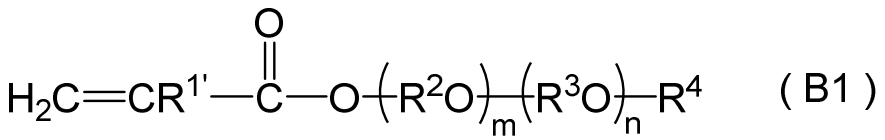
A laminated antifouling coating film comprising an underlying coating film (u) having thereon an antifouling coating film, which is formed by curing an antifouling coating composition, the underlying coating film (u) being formed by curing an epoxy curable underlying coating composition or a urethane curable underlying coating composition,

wherein:

the antifouling coating composition comprises:

a curable organopolysiloxane (A); and

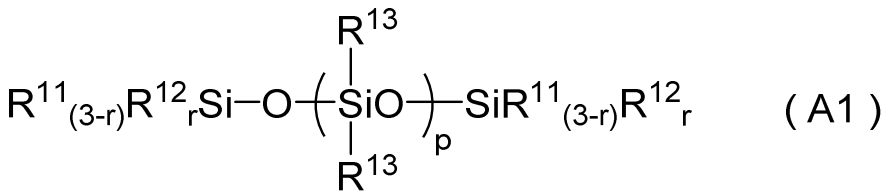
a polymer (B) containing a constituent unit derived from an unsaturated monomer (b1) represented by the following formula (B1):



(B1)

wherein $R^{1'}$ represents a hydrogen atom or a methyl group; R^2 represents an ethylene group or a propylene group; R^3 represents a butylene group; m represents an integer of 3 to 15; n represents an integer of 0 to 5; and R^4 represents a hydrogen atom or a monovalent aliphatic hydrocarbon group having 1 to 8 carbon atoms; plural groups represented by R^2 may be the same as or different from each other, and at least one of the groups represented by R^2 is an ethylene group,

the curable organopolysiloxane (A) is a compound represented by the following formula (A1):



(A1)

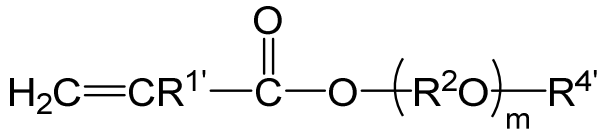
wherein R^{11} and R^{13} each independently represent a hydrogen atom, an alkyl

group, an alkenyl group, an aryl group, an aralkyl group, or a halogenated alkyl group, each having 1 to 16 carbon atoms; R^{12} each independently represent a hydroxy group or a hydrolyzable group; r represents an integer of 1 to 3; and p represents from 10 to 10,000, and

the polymer (B) has a weight average molecular weight of 5,000 to 30,000.

[Claim 2]

The laminated antifouling coating film according to claim 1, wherein the unsaturated monomer (b1) is represented by the following formula (II):

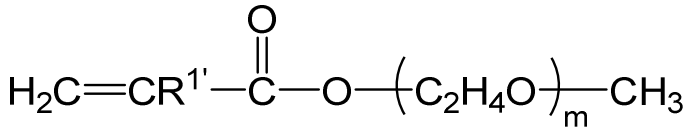


(II)

wherein $R^{1'}$ represents a hydrogen atom or a methyl group; R^2 represents an ethylene group or a propylene group; m represents an integer of 3 to 15; and $R^{4'}$ represents a hydrogen atom or a methyl group; plural groups represented by R^2 may be the same as or different from each other, and at least one of the groups represented by R^2 is an ethylene group.

[Claim 3]

The laminated antifouling coating film according to claim 1, wherein the unsaturated monomer (b1) is represented by the following formula (III):



(III)

wherein $R^{1'}$ represents a hydrogen atom or a methyl group; and m represents an integer of 3 to 15.

[Claim 4]

The laminated antifouling coating film according to any one of claims 1 to 3, wherein the polymer (B) contains, not only the unsaturated monomer (b1), but also a constituent unit derived from the other unsaturated monomer (b5), and the other unsaturated monomer (b5) contains an unsaturated monomer (b51) represented by the following formula (IV):

$$H_2C{=}CR^{41}{-}X{-}R^{42} \qquad (IV)$$

wherein R^{41} represents a hydrogen atom or a monovalent hydrocarbon group having 1 to 10 carbon atoms; R^{42} represents a hydrogen atom or a monovalent hydrocarbon group having 1 to 50 carbon atoms; and X represents an ester bond, an amide bond, or a single bond.

[Claim 5]

The laminated antifouling coating film according to any one of claims 1 to 4, wherein the polymer (B) has a content of the constituent unit derived from the unsaturated monomer (b1) therein of 1 to 100% by mass.

[Claim 6]

The laminated antifouling coating film according to any one of claims 1 to 5, wherein the antifouling coating composition further comprises a silane coupling agent (D).

[Claim 7]

The laminated antifouling coating film according to any one of claims 1 to 6, wherein the antifouling coating composition further comprises a silicone oil (E).

[Claim 8]

The laminated antifouling coating film according to any one of claims 1 to 7, wherein the antifouling coating composition further comprises an antifouling agent (F).

[Claim 9]

A substrate with an antifouling coating film, comprising a substrate having thereon the laminated antifouling coating film according to any one of claims 1 to 8,

[Claim 10]

The substrate with an antifouling coating film according to claim 9, wherein the substrate is selected from the group consisting of a ship, an underwater structure, and a fishing gear.

[Claim 11]

An antifouling method comprising using the laminated antifouling coating film according to any one of claims 1 to 8.