CLAIMS

[Claim 1] An antifouling coating composition comprising a silicon atom-containing resin,

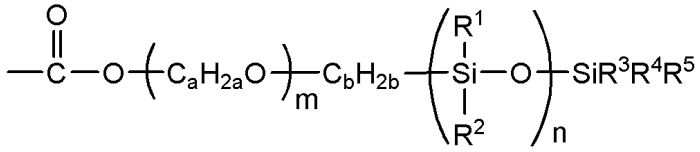
wherein

the silicon atom-containing resin includes:

a constituent unit (A) derived from a monomer (a) having at least one kind of silicon atom-containing group selected from the group consisting of a group represented by a formula (I) below, a group represented by a formula (II) below, a group represented by a formula (III) below, and a group represented by a formula (IV) below; and

a constituent unit (B) derived from a monomer (b) which is a polyfunctional (meth)acrylic acid ester having two or more (meth)acryloyloxy groups:

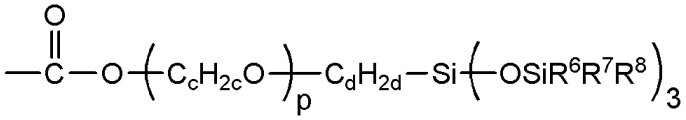
[Chemical formula 1]



(I)

[in the formula (I), a and b each independently represent an integer of 2 to 5, m represents an integer of 0 to 50, and n represents an integer of 3 to 270; and R^1 to R^5 each independently represent an alkyl group, an alkoxy group, a phenyl group, a substituted phenyl group, a phenoxy group, or a substituted phenoxy group];

[Chemical formula 2]

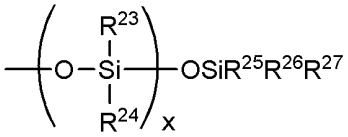


(II)

[in the formula (II), c and d each independently represent an integer of 2 to 5, and p represents an integer of 0 to 50; R^6, R^7 and R^8 each independently represent an alkyl group, R^a, or R^b;

R^a is

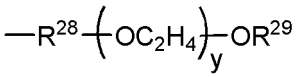
[Chemical formula 3]



(in the formula, x represents an integer of 0 to 200, and R^{23} to R^{27} are the same or different and each represent an alkyl group); and

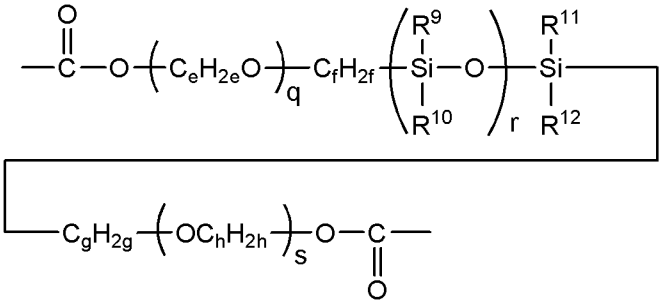
R^b is

[Chemical formula 4]



(in the formula, y represents an integer of 1 to 200, and R^{28} and R^{29} are the same or different and each represent an alkyl group)];

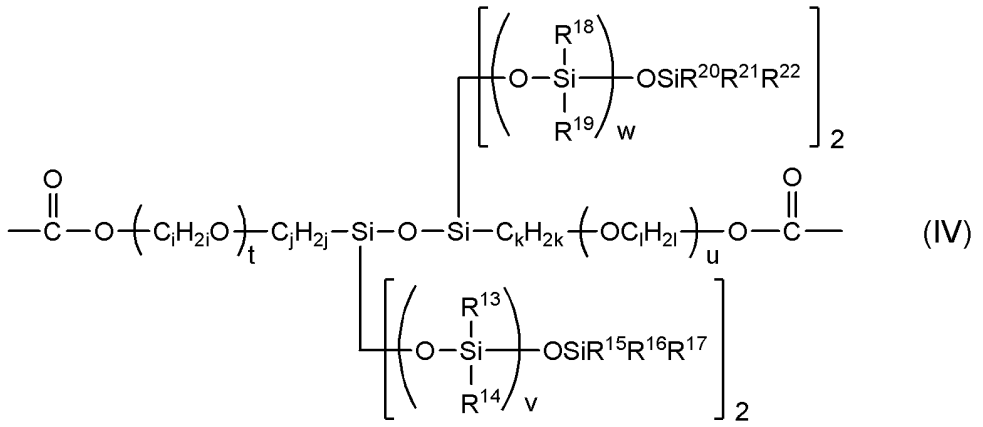
[Chemical formula 5]



(III)

[in the formula (III), e, f, g, and h each independently represent an integer of 2 to 5, q and s each independently represent an integer of 0 to 50, and r represents an integer of 3 to 270; and R^9 to R^{12} each independently represent an alkyl group, an alkoxy group, a phenyl group, a substituted phenyl group, a phenoxy group, or a substituted phenoxy group];

[Chemical formula 6]



(IV)

[in the formula (IV), i, j, k, and l each independently represent an integer of 2 to 5, t and u each independently represent an integer of 0 to 50, and v and w each independently represent an integer of 0 to 70; and R^{13} to R^{22} are the same or different and each represent an alkyl group],

wherein a content of the constituent unit (B) is less than or equal to 30 mass% in all constituent units contained in the silicon atom-containing resin.

[Claim 2] The antifouling coating composition according to claim 1, wherein the silicon atom-containing resin further includes a constituent unit (C) derived from a monomer (c) having a triorganosilyloxycarbonyl group.

[Claim 3] The antifouling coating composition according to claim 1 or 2, wherein the silicon atom-containing resin further includes a constituent unit (D) derived from a monomer (d) which is a monofunctional (meth)acrylic acid ester represented by a formula (d) below:

$CH_2=C(R^C)(COOR^D)$ (d)

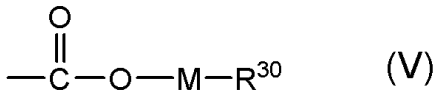
[in the formula (d), R^C represents a hydrogen atom or a methyl group; and R^D represents a monovalent group including one or more kinds selected from the group consisting of a hydroxyl group, a carboxy group, and an oxyalkylene chain].

[Claim 4] The antifouling coating composition according to claim 3, wherein R^D in the formula (d) represents a monovalent group containing an oxyalkylene chain.

[Claim 5] The antifouling coating composition according to claim 1 or 2, wherein a content of the constituent unit (A) is greater than or equal to 20 mass% in all constituent units contained in the silicon atom-containing resin.

[Claim 6] The antifouling coating composition according to claim 1 or 2, wherein the silicon atom-containing resin further includes a constituent unit (E) derived from a monomer (e) having at least one kind of metal atom-containing group selected from the group consisting of a group represented by a formula (V) below and a group represented by a formula (VI) below:

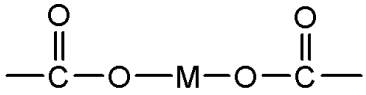
[Chemical formula 7]



(V)

[in the formula (V), M represents a divalent metal atom, and R^{30} represents an organic acid residue or an alcohol residue]; and

[Chemical formula 8]



(VI)

[in the formula (VI), M represents a divalent metal atom].

[Claim 7] The antifouling coating composition according to claim 1 or 2, not comprising an antifouling agent.

[Claim 8] The antifouling coating composition according to claim 1 or 2, further comprising an antifouling agent.

[Claim 9] The antifouling coating composition according to claim 8, wherein the antifouling agent is at least one kind selected from the group consisting of cuprous oxide, pyrithione metal salt, 4,5-dichloro-2-n-octyl-4-isothiazolin-3-one, 2-methylthio-4-t-butylamino-6-cyclopropylamino-s-triazine, 4-bromo-2-(4-chlorophenyl)-5-(trifluoromethyl)-1H-pyrrole-3-carbonitrile, and medetomidine.

[Claim 10] An antifouling coating film formed from the antifouling coating composition according to claim 1.

[Claim 11] A composite coating film comprising a primer coating film formed from an antirust coating composition, and an antifouling coating film formed from the antifouling coating composition according to claim 1 and overlaid on the primer coating film.

[Claim 12] A ship comprising the antifouling coating film according to claim 10 or the composite coating film according to claim 11.

[Claim 13] An in-water structure comprising the antifouling coating film according to claim 10 or the composite coating film according to claim 11.