CLAIMS

1. An antifouling coating composition comprising a silicon atom-containing resin and an anti-sagging agent,

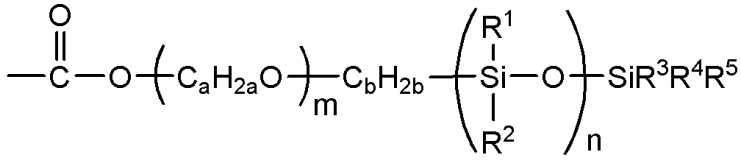
wherein

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,

the monomer (a) has a molecular weight greater than or equal to 400 and less than or equal to 2500, and

a content of the anti-sagging agent is greater than or equal to 0.7 parts by mass and less than or equal to 3.6 parts by mass with respect to 100 parts by mass of the silicon atom-containing resin:

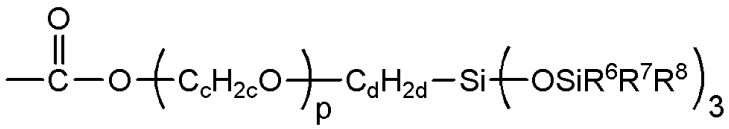
[Chemical formula 1]



(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 80; 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]



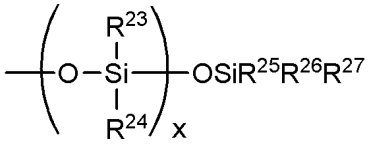
(II)

[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

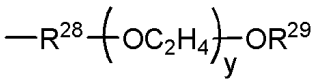
[Chemical formula 3]



(in the formula, x represents an integer of 0 to 20; and R^{23} to R^{27} are the same or different and each represent an alkyl group); and

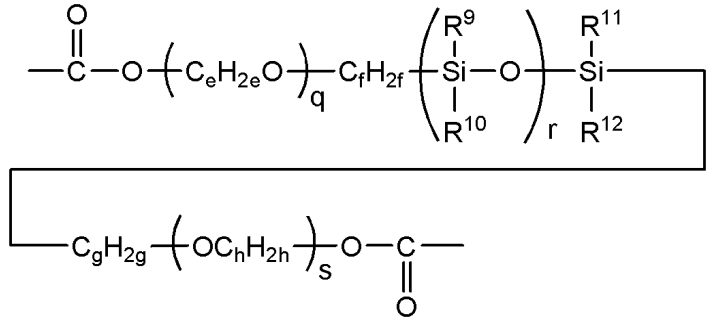
R^b is

[Chemical formula 4]



(in the formula, y represents an integer of 1 to 20; and R^{28} and R^{29} are the same or different and each represent an alkyl group)];

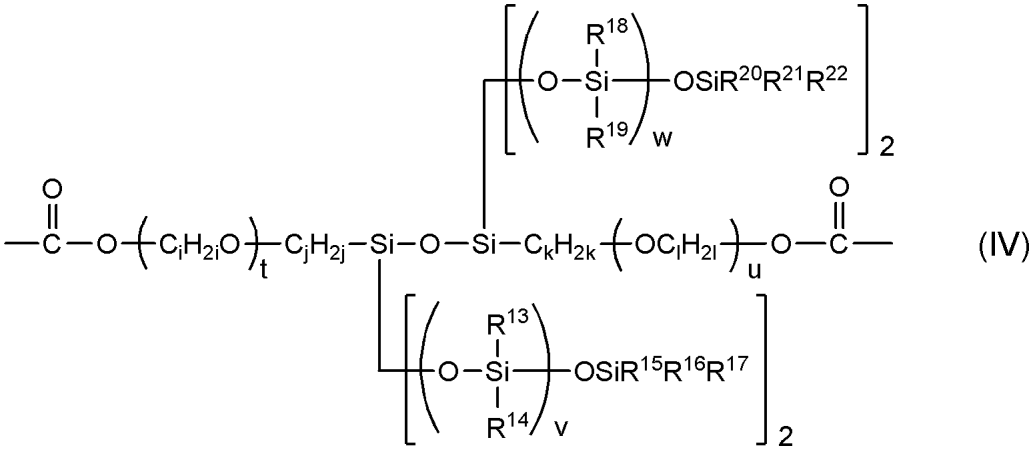
[Chemical formula 5]



(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 80; 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]; and

[Chemical formula 6]

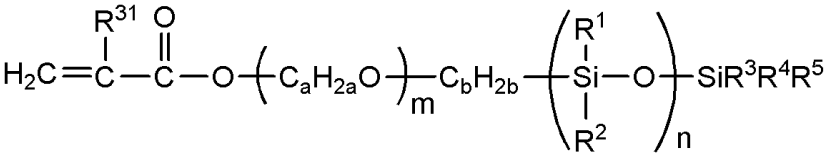


(IV)

[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, v and w each independently represent an integer of 0 to 20; and R^{13} to R^{22} are the same or different and each represent an alkyl group].

2. The antifouling coating composition according to claim 1, wherein the monomer (a) is at least one kind selected from the group consisting of a monomer (a1) represented by a formula (I') below, a monomer (a2) represented by a formula (II') below, a monomer (a3) represented by a formula (III') below, and a monomer (a4) represented by a formula (IV') below:

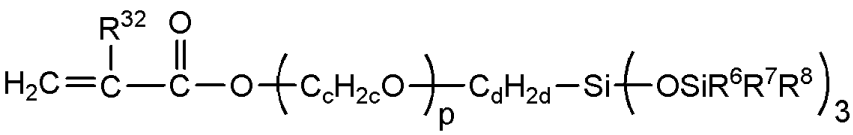
[Chemical formula 7]



(I')

[in the formula (I'), R^{31} represents a hydrogen atom or a methyl group, and a, b, m, n and R^{1} to R^{5} represent the same meaning as previously mentioned];

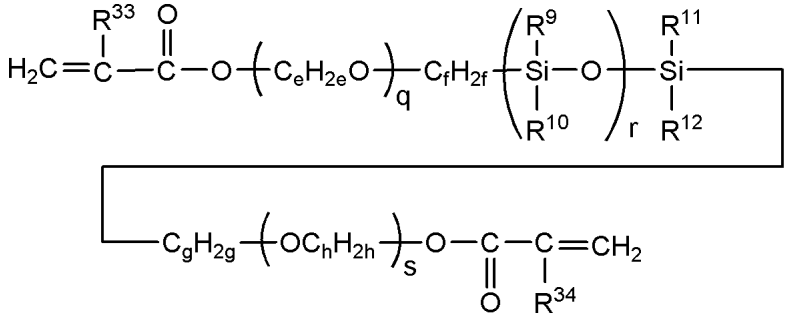
[Chemical formula 8]



(II')

[in the formula (II'), R^{32} represents a hydrogen atom or a methyl group, and c, d, p, and R^6 to R^8 represent the same meaning as previously mentioned];

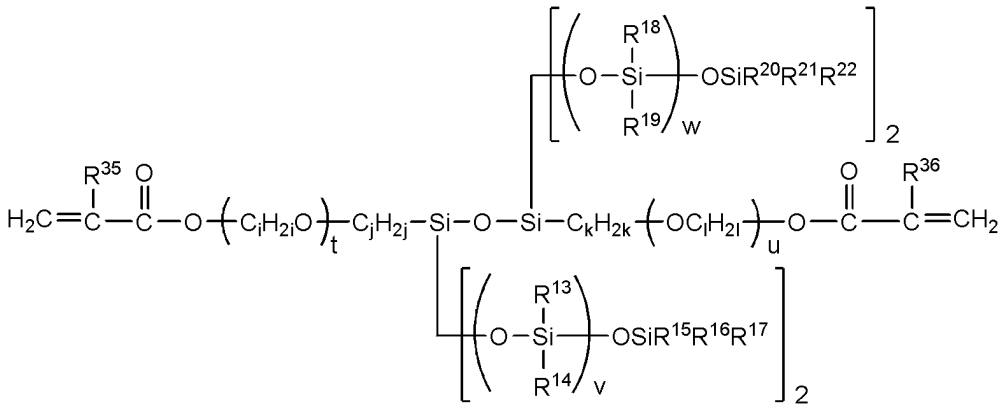
[Chemical formula 9]



(III')

[in the formula (III'), R^{33} and R^{34} each independently represent a hydrogen atom or a methyl group, and e, f, g, h, q, r, s and R^9 to R^{12} represent the same meaning as previously mentioned]; and

[Chemical formula 10]



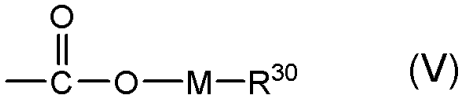
(IV')

[in the formula (IV'), R^{35} and R^{36} each independently represent a hydrogen atom or a methyl group, and i, j, k, l, t, u, v, w and R^{13} to R^{22} represent the same meaning as previously mentioned].

3. The antifouling coating composition according to claim 1 or 2, wherein the silicon atom-containing resin further includes a constituent unit (B) derived from a monomer (b) 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:

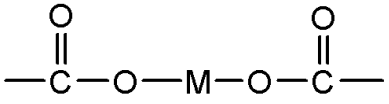
[Chemical formula 11]



(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 12]

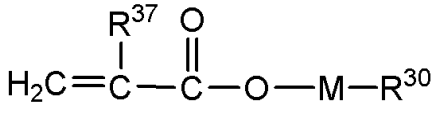


(VI)

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

4. The antifouling coating composition according to claim 3, wherein the monomer (b) is at least one kind selected from the group consisting of a monomer (b1) represented by a formula (V') below and a monomer (b2) represented by a formula (VI') below:

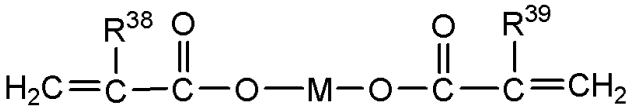
[Chemical formula 13]



(V')

[in the formula (V'), R^{37} represents a hydrogen atom or a methyl group, and M and R^{30} represent the same meaning as previously mentioned]; and

[Chemical formula 14]



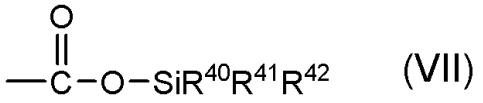
(VI')

[in the formula (VI'), R^{38} and R^{39} each independently represent a hydrogen atom or a methyl group, and M represents the same meaning as previously mentioned].

5. The antifouling coating composition according to any one of claims 1 to 4,

wherein the silicon atom-containing resin further includes a constituent unit (C) derived from a monomer (c) having a group represented by a formula (VII) below:

[Chemical formula 15]

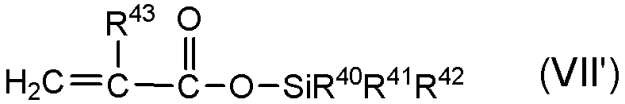


(VII)

[in the formula (VII), R^{40}, R^{41} and R^{42} are the same or different and each represent a hydrocarbon residue having 1 to 20 carbon atoms].

6. The antifouling coating composition according to claim 5, wherein the monomer (c) is a monomer (c1) represented by a formula (VII') below:

[Chemical formula 16]



(VII')

[in the formula (VII'), R^{43} represents a hydrogen atom or a methyl group, and R^{40} to R^{42} represent the same meaning as previously mentioned].

7. The antifouling coating composition according to any one of claims 1 to 6, wherein the anti-sagging agent includes an amide-based anti-sagging agent.

8. A coating film formed from the antifouling coating composition according to any one of claims 1 to 7.

9. A composite coating film comprising a primer coating film formed from an antirust paint, and a coating film formed from the antifouling coating composition according to any one of claims 1 to 7 and overlaid on the primer coating film.

10. The composite coating film according to claim 9, wherein the composite coating film further comprises an intermediate coating film between the primer coating

film and the coating film, and the intermediate coating film is formed on an entire or part of a surface of the primer coating film.

11. An in-water structure comprising the coating film according to claim 8 or the composite coating film according to claim 9 or 10.

12. A ship comprising the coating film according to claim 8 or the composite coating film according to claim 9 or 10.