

Claims

1. A fouling release coating composition comprising:
- 5 a) a curable polysiloxane based binder comprising at least 50 wt% polysiloxane parts;
- b) an antifouling agent; and
- c) 10-30% by dry weight of a non-ionic hydrophilic-modified polysiloxane having
- 10 i) a hydrophilic-lipophilic balance (HLB) of 1-12, and
- ii) an Mn of 500-18,000 g/mol.
2. A fouling release coating composition comprising:
- a) a curable polysiloxane based binder comprising at least 50 wt% polysiloxane parts;
- 15 b) an antifouling agent; and
- c) 10-30% by dry weight of a non-ionic hydrophilic-modified polysiloxane having
- i) a hydrophilic-lipophilic balance (HLB) of 1-12, and
- 20 ii) a Mw of 1,000-50,000 g/mol.
3. The fouling release coating composition of any preceding claim, wherein the composition comprises 30-95 wt% polysiloxane-based binder, more preferably 40-90 wt% polysiloxane-based binder and still more preferably 50-90 wt% polysiloxane-based binder, based on the total dry weight of the composition.
- 25 4. The fouling release coating composition of any preceding claim, wherein the antifouling agent is present in an amount of 1-15 wt%, preferably 2-15 wt%, more preferably 3-12 wt%, by dry weight basis, based on the total dry weight of the composition.
- 30 5. The fouling release coating composition of any preceding claim, wherein the non-ionic hydrophilic-modified polysiloxane is present in an amount of 11-29 wt% by dry weight, preferably 12-28% by dry weight, preferably 13-27% by dry weight, preferably 14-26% by dry weight, e.g. 15-25 wt% by dry weight, based on
- 35 the total dry weight of the composition.

6. The fouling release coating composition of any preceding claim, wherein the antifouling agent is zinc pyrithione or copper pyrithione, preferably copper pyrithione.

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7. The fouling release coating composition of any preceding claim, wherein the non-ionic hydrophilic-modified polysiloxane has a number average molecular weight (Mn) in the range of 500-18,000 g/mol, such as in the range of 1000-16,000 g/mol, particularly in the ranges 2000-15,050 g/mol or 4000-15,050 g/mol.

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8. The fouling release coating composition of any preceding claim, wherein the non-ionic hydrophilic-modified polysiloxane has a viscosity in the range of 20-4,000 mPa-s, preferably in the range of 30-3,000 mPa-s, in particular in the range of 50-2,500 mPa-s

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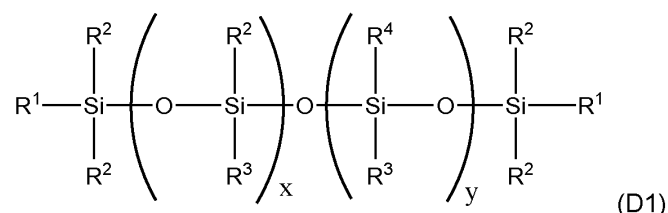
9. The fouling release coating composition of any preceding claim, wherein the non-ionic hydrophilic-modified polysiloxane has a weight average molecular weight (Mw) of 2,000-45,000 g/mol, preferably 3,000-42,000 g/mol, 4,000-40,000 g/mol, or 5,000-40,000 g/mol.

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10. The fouling release coating composition of any preceding claim, wherein the non-ionic hydrophilic-modified polysiloxane has an HLB (hydrophilic-lipophilic balance) in the range 1.0-10, more preferably 1.0-8.0, most preferably 2.0-7.0.

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11. The fouling release coating composition of any preceding claim, wherein the polysiloxane-based binder is represented by formula D1:



wherein

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each R¹ is independently selected from a hydroxyl group, C₁₋₆-alkoxy group, C₁₋₆-hydroxyl group, C₁₋₆-epoxy containing group, C₁₋₆ amine group or O-Si(R⁵)_{3-z} (R⁶)_z

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- each R² is independently selected from C₁₋₁₀ alkyl, C₆₋₁₀ aryl, C₇₋₁₀ alkylaryl or C₁₋₆ alkyl substituted by poly(alkylene oxide) and/or a group as described for R¹;
each R³ and R⁴ is independently selected from C₁₋₁₀ alkyl, C₆₋₁₀ aryl, C₇₋₁₀ alkylaryl or C₁₋₆ alkyl substituted by poly(alkylene oxide);
- 5 each R⁵ is independently a hydrolysable group such as C₁₋₆ alkoxy group, an acetoxo group, an enoxy group or ketoxy group;
each R⁶ is independently selected from an unsubstituted or substituted C₁₋₆ alkyl group;
- z is 0 or an integer from 1-2;
- 10 x is an integer of at least 2;
y is an integer of at least 2;
12. The fouling release coating composition of any preceding claim, further comprising at least one of a filler, pigment, solvent, additive, curing agent and
- 15 catalyst; or
a paint comprising a fouling release coating composition as claimed in claim 1 to 12 and at least one of a filler, pigment, solvent, additive, curing agent and catalyst.
- 20 13. The fouling release coating composition of any preceding claim, wherein said non-ionic hydrophilic modified polysiloxane is a polyether-modified polysiloxane.
14. The fouling release coating composition of any preceding claim, wherein
- 25 said non-ionic hydrophilic modified polysiloxane is non-curable in the curing reaction of the binder at 0 – 40 °C.
15. A fouling release coating composition comprising:
- a) a curable polysiloxane based binder comprising at least 50 wt%
- 30 polysiloxane parts;
- b) an antifouling agent; and
- c) 10-30% by dry weight of a non-ionic hydrophilic-modified polysiloxane having
- i) a relative weight of hydrophilic moieties in the range
- 35 5-60 wt.%, and

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ii) an Mn of 500-18,000 g/mol.

16. A fouling release coating composition comprising:

- 5 a) a curable polysiloxane based binder comprising at least 50 wt% polysiloxane parts;
- b) an antifouling agent; and
- c) 10-30% by dry weight of a non-ionic hydrophilic-modified polysiloxane having
- 10 i) a relative weight of hydrophilic moieties in the range 5-60 wt.%, and
- ii) a Mw of 1,000-50,000 g/mol.

17. The fouling release composition as claimed in claim 15 or 16, wherein the fouling release composition is as claimed in any of claims 1 to 14.

18. A marine structure comprising on at least a part of the outer surface thereof a fouling release coating composition as claimed in any of claims 1 to 17.

19. A process for preparing the fouling release coating composition of any of claims 1 to 14, comprising a step of mixing:

- 20 a) a curable polysiloxane-based binder comprising at least 50 wt% polysiloxane parts;
- b) an antifouling agent; and
- c) 10-30% by dry weight of a non-ionic hydrophilic-modified polysiloxane having
- 25 i) an HLB of 1-12, and
- ii) an Mn of 500-18,000 g/mol and/or a Mw of 1,000-50,000 g/mol;
- typically in at least one solvent.

20. A process for preparing the fouling release coating composition of any of claims 15 to 17, comprising a step of mixing:

- a) a curable polysiloxane-based binder comprising at least 50 wt% polysiloxane parts;
- 35 b) an antifouling agent; and

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- c) 10-30% by dry weight of a non-ionic hydrophilic-modified polysiloxane having
- i) a relative weight of hydrophilic moieties in the range 5-60 wt.%, and
 - 5 ii) an Mn of 500-18,000 g/mol and/or a Mw of 1,000-50,000 g/mol;
- typically in at least one solvent.
21. A kit for preparing a fouling release coating composition as claimed in any of
- 10 claims 1-17, comprising:
- (i) a first container containing the curable polysiloxane based binder, the antifouling agent and/or the non-ionic hydrophilic-modified polysiloxane;
 - (ii) a second container containing a crosslinking agent and/or a curing agent and optionally a catalyst;
 - 15 (iii) optionally a third container containing a catalyst; and
 - (iv) optionally instructions for combining the contents of said containers.