Summary

Thus, the disclosure provides a marine antifouling coating composition comprising:

(A) a binder comprising a silyl ester copolymer and a rosin or derivative thereof;

(B) tralopyril or a salt thereof; and

(C) a stabilizer selected from at least one of a carbodiimide or a silane formula (I):

$$SiR_n(OR)_{4-n} \quad (I)$$

in which n = 0, 1, 2 or 3, and each R is independently a C1-20 hydrocarbyl group in which each R is optionally interrupted by an O group.

In one aspect, there is provided a marine antifouling coating composition comprising:

(A) a binder comprising a silyl ester copolymer and a rosin or a derivative thereof;

(B) tralopyril or a salt thereof; and

(C) a stabilizer selected from at least one of a carbodiimide or a silane formula (I):

$$SiR_n(OR)_{4-n} \quad (I)$$

in which n = 0, 1, 2 or 3, and each R is independently a C1-20 hydrocarbyl group in which each R is optionally interrupted by an O group;

wherein the marine antifouling coating composition contains less than 0.2 wt% (dry solids) cuprous oxide.

Ideally, the rosin is present in an amount of at least 1 wt% (dry solids) of the antifouling coating composition. Preferably, the antifouling coating composition contains less than 0.2 wt% (dry solids) cuprous oxide(s), such as less than 0.1 wt% cuprous oxide, ideally no cuprous oxide.

The disclosure provides a process for the manufacture of the anti-fouling coating composition as herein before defined comprising blending:

(A) a binder comprising a silyl ester copolymer and a rosin or derivative thereof;

(B) tralopyril or a salt thereof; and

(C) a stabilizer selected from at least one of a carbodiimide or a silane of formula (I)

$$SiR_n(OR)_{4-n} \quad (I)$$

in which n = 0, 1, 2 or 3, and each R is independently a C1-20 hydrocarbyl group in which each R is optionally interrupted by an O group.

In another aspect the disclosure provides a process for protecting an object from fouling, comprising coating at least a part of said object which is subject to fouling with an anti-fouling coating composition as hereinbefore defined.

In a further aspect the disclosure provides an object coated with the antifouling coating composition as hereinbefore defined. The object is preferably a marine object such as the hull of a ship or other substrate exposed repeatedly to sea water.

The disclosure provides the use of an antifouling coating composition as hereinbefore defined to prevent fouling of a marine surface.

The disclosure provides a marine antifouling coating composition comprising:

(i) 0.5 to 45 wt% of a silyl ester copolymer

(ii) 0.5 to 45 wt% of a rosin or derivative thereof;

(iii) 0.5 to 10 wt% of tralopyril or a salt thereof; and

(iv) 0.05 to 5.0 wt% a stabilizer selected from at least one of a carbodiimide or a silane formula (I):

$$SiR_n(OR)_{4-n} \quad (I)$$

in which n = 0, 1, 2 or 3, and each R is independently a C1-20 hydrocarbyl group in which each R is optionally interrupted by an O group.

Definitions

The term hydrocarbyl group refers to any group containing C atoms and H atoms only and therefore covers alkyl, alkenyl, aryl, cycloalkyl, arylalkyl groups and so on.

The term rosin used in the text which follows is being used to cover "rosin or derivatives thereof".

Detailed description of invention

The antifouling coating composition of the invention comprises a binder (A) comprising a silyl ester copolymer and a rosin, tralopyril (B), and a stabilizer (C) selected from a carbodiimide and/or a silane as hereinbefore defined. The

Claims

1. A marine antifouling coating composition comprising:

(A) a binder comprising a silyl ester copolymer and a rosin or a derivative thereof;

(B) tralopyril or a salt thereof; and

(C) a stabilizer selected from at least one of a carbodiimide or a silane formula (I):

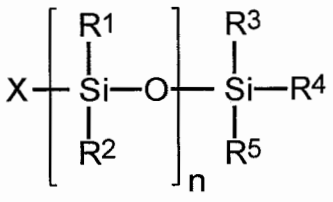
$$SiR_n(OR)_{4-n} \qquad (I)$$

in which n = 0, 1, 2 or 3, and each R is independently a C1-20 hydrocarbyl group in which each R is optionally interrupted by an O group;
wherein the marine antifouling coating composition contains less than 0.2 wt% (dry solids) cuprous oxide.

2. A marine antifouling coating composition as claimed in claim 1 wherein the rosin or derivative thereof is present in an amount of at least 0.5 wt% (dry solids) of the antifouling coating composition, preferably the rosin or derivative thereof is present in an amount of 1 to 45 wt% (dry solids), preferably 1 to 20 wt%, such as 10 to 15 wt%.

3. A marine antifouling coating composition as claimed in any preceding claim wherein the antifouling coating composition contains less than 0.2 wt% (dry solids) copper compounds.

4. An antifouling coating composition as claimed in any preceding claim, wherein said silyl ester copolymer comprises at least one monomer (A) of formula (II):



(II)

wherein

R^1 and R^2 are each independently selected from linear or branched C_{1-4} alkyl groups;

R^3, R^4 and R^5 are each independently selected from the group consisting of linear or branched C_{1-20} alkyl groups, C_{3-12} cycloalkyl groups, C_{6-20} aryl groups and $-OSi(R^6)_3$ groups;

each R^6 is a linear or branched C_{1-4} alkyl group,

n is an integer from 0 to 5;

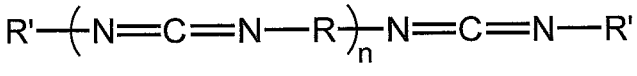
X is an ethylenically unsaturated group, preferably an acryloyloxy group, methacryloyloxy group, (methacryloyloxy)alkylcarboxy group, (acryloyloxy)alkylcarboxy group, maleinoyloxy group, fumaroyloxy group, itaconoyloxy group or citraconoyloxy group.

5. An antifouling coating composition according to claim 4, wherein the silyl ester monomers are compounds of formula (II) in which n=0.

6. An antifouling coating composition according to any preceding claim wherein the silyl ester copolymer is present in an amount of 0.5 to 45 wt% (dry solids), preferably 1 to 30 wt% of the composition.

7. An antifouling coating composition according to any preceding claim comprising tralopyril in an amount of 0.5 to 10 wt%, preferably 1 to 7 wt%, 2 to 6 wt%.

8. An antifouling coating composition according to any preceding claim wherein the stabilizer comprises a carbodiimide of formula (III):



(III)

wherein

R is an optionally substituted arylene, optionally substituted alkylene or optionally substituted cycloalkylene group;

each R' is independently identical or different and is an optionally substituted aryl, optionally substituted alkyl, or optionally substituted cycloalkyl group, and

n is an integer from 0 to 500, preferably from 0 to 50.

9. An antifouling coating composition according to claim 8 wherein R is a substituted C_{6-10} arylene, substituted with one or more of a halogen, an alkyl group having 1 to 8 carbon atoms or a C_{3-8}-cycloalkyl group.

10. An antifouling coating composition according to any preceding claim, wherein the carbodiimide is present in an amount of 0.05 to 5 wt% , preferably 0.5 to 3 wt%, most preferably 1 to 2 wt% of the composition.

11. An antifouling composition according to any preceding claim wherein the stabilizer comprises a silane of formula (X)

$$Si(OR)_4 \quad (X)$$

wherein R is independently a C1-10 alkyl group or a C6-10 aryl group, most preferably the silane is tetraethoxysilane or tetramethoxysilane.

12. An antifouling composition according to any preceding claim wherein the silane is present in an amount of 0.05 to 5 wt% preferably 0.5 to 3 wt%, most preferably 1 to 2 wt%.

13. A marine antifouling coating composition according to claim 1 comprising:

(i) 0.5 to 45 wt% of a silyl ester copolymer

(ii) 0.5 to 45 wt% of a rosin or derivative thereof;

(iii) 0.5 to 10 wt% of tralopyril or a salt thereof; and

(iv) 0.1 to 5.0 wt% a stabilizer selected from at least one of a carbodiimide or a silane formula (I):

$$SiR_n(OR)_{4-n} \quad (I)$$

in which n = 0, 1, 2 or 3, and each R is independently a C1-20 hydrocarbyl group in which each R is optionally interrupted by an O group.

14. A process for protecting an object from fouling comprising coating at least a part of said object which is subject to fouling with an anti-fouling coating composition as claimed in any preceding claim.

15. An object coated with the antifouling coating composition as claimed in any of claims 1 to 13.