Claims

1. A process for controlling aquatic fouling on a surface of a man-made object comprising:

- applying on the surface of the man-made object a first layer of a tie-coat composition;
- applying on the first layer of tie-coat composition a second layer of a topcoat composition comprising a resin with condensable silane groups; and
- allowing the first and second coating layers to cure;

wherein the tie-coat composition comprises one or more binder polymers obtainable by copolymerizing a mixture of ethylenically unsaturated monomers, the one or more binder polymers comprising pendant curable alkoxysilyl functional groups of general formula (I)

$$-X\text{-}L\text{–}Si(R^1)_n(OR^2)_{(3-n)} \qquad (I)$$

wherein:

L is a hydrocarbon linker group having 1 to 20 carbon atoms;

X is a heteroatom other than a sulphur atom, preferably an oxygen or nitrogen atom;

n is 0, 1, or 2, preferably n is 0 or 1;

R^1 is an alkyl radical with 1 to 20 carbon atoms; and

R^2 is an alkyl radical with 1 to 20 carbon atoms or an alkylalkoxy radical with 2 to 20 carbon atoms, preferably an alkyl radical with 1 to 20 carbon atoms,

wherein in at least 5 mole% of the curable alkoxysilyl functional groups comprised in the one or more binder polymers the hydrocarbon linker group L is a methyldiyl group (L1) and in at least 5 mole% of the curable alkoxysilyl functional groups comprised in the one or more binder polymers the hydrocarbon linker group L is a hydrocarbon group having 2 to 20

carbon atoms (L2),

wherein the tie-coat composition does not comprise a crosslinking agent.

2. A substrate coated with a tie-coat layer and a topcoat layer, wherein the tie-coat layer is deposited from a tie-coat composition comprising one or more binder polymers obtainable by copolymerizing a mixture of ethylenically unsaturated monomers, the one or more binder polymers comprising pendant curable alkoxysilyl functional groups of general formula (I)

$$-X\text{-}L\text{–}Si(R^1)_n(OR^2)_{(3-n)} \quad (I)$$

wherein:

L is a hydrocarbon linker group having 1 to 20 carbon atoms;

X is a heteroatom other than a sulphur atom, preferably an oxygen or nitrogen atom;

n is 0, 1, or 2, preferably n is 0 or 1;

R^1 is an alkyl radical with 1 to 20 carbon atoms; and

R^2 is an alkyl radical with 1 to 20 carbon atoms or an alkylalkoxy radical with 2 to 20 carbon atoms, preferably an alkyl radical with 1 to 20 carbon atoms,

wherein in at least 5 mole% of the curable alkoxysilyl functional groups comprised in the one or more binder polymers the hydrocarbon linker group L is a methyldiyl group (L1) and in at least 5 mole% of the curable alkoxysilyl functional groups comprised in the one or more binder polymers the hydrocarbon linker group L is a hydrocarbon group having 2 to 20 carbon atoms (L2),

wherein the tie-coat composition does not comprise a crosslinking agent, and

wherein the topcoat layer is deposited from a topcoat composition comprising a resin with condensable silane groups.

3. A process according to claim 1 or a substrate according to claim 2, wherein in the tie-coat composition the molar ratio between curable alkoxysilyl functional groups with linker group L1 and curable alkoxysilyl functional groups with linker group L2 is in the range of from 15:85 to 75:25, preferably of from 20:80 to 70:30.

4. A process according to claim 1 or 3 or a substrate according to claim 2 or 3, wherein in the tie-coat composition linker group L2 is an alkyldiyl group having 2 to 6 carbon atoms, preferably a propyldiyl group.

5. A process according to any one of claims 1, 3 and 4 or a substrate according to any one of claims 2 to 4, wherein in the tie-coat composition R^1 and R^2 are, independently an alkyl radical with 1 to 6 carbon atoms, more preferably a methyl or ethyl radical.

6. A process according to any one of claims 1 and 3 to 5 or a substrate according to any one of claims 2 to 5, wherein the tie coat composition comprises a first and a second binder polymer as specified in any one of the preceding claims, wherein the curable alkoxysilyl functional groups comprised in the first binder polymer have the linker group L1 and the curable alkoxysilyl functional groups comprised in the second binder polymer have the linker group L2.

7. A process according to any one of claims 1 and 3 to 6 or a substrate according to any one of claims 2 to 6, wherein in the tie-coat composition the ethylenically unsaturated monomers are esters of acrylic acid and/or methacrylic acid, preferably C1-C16 esters of acrylic acid and/or methacrylic acid.

8. A process according to any one of claims 1 and 3 to 7 or a substrate

according to any one of claims 2 to 7, wherein in the tie-coat composition the one or more binder polymers are, independently, obtainable by copolymerising a mixture of ethylenically unsaturated monomers with alkoxysilyl functionality and ethylenically unsaturated monomers monomers without alkoxysilyl functionality.

9. A process or a substrate according to claim 8, wherein in the tie-coat composition the molar ratio of ethylenically unsaturated monomers with alkoxysilyl functionality and ethylenically unsaturated monomers without alkoxysilyl functionality is in the range of from 5:95 to 25:75.

10. A process according to any one of claims 1 and 3 to 9 or a substrate according to any one of claims 2 to 9, wherein in the topcoat composition the resin with condensable silane groups is a curable polydiorganosiloxane resin.

11. A process according to any one of claims 1 and 3 to 10 or a substrate according to any one of claims 2 to 10, wherein the topcoat composition further comprises a non-volatile, non-curable fluid.

12. A process or a substrate according to claim 11, wherein the non-volatile, non-curable fluid is a poly(oxyalkylene)-modified polysiloxane.

13. A process according to any one of claims 1 and 3 to 12, wherein an aged or damaged coating is present on the surface of the man-made object to which the first layer of tie-coat composition is applied.

14. A substrate according to claim 2 to 12, wherein the tie-coat layer is deposited on an aged or damaged coating.