Claims

1. A process for preparing a multilayer coating system comprising at least two coating layers wherein

i) a first coating layer is applied by spray application to a wet film thickness of 50-300 µm; and

ii) a second coating layer is applied by spray application to a wet film thickness of 50-300 µm;

wherein the second coating layer is applied directly on top of the first coating layer 5 min to 6 hours after the first coating layer is applied; and

wherein the first and the second coating layers independently comprise a polysiloxane-based coating composition comprising

a) a polysiloxane-based binder system; and

b) a curing or crosslinking agent.

2. The process as claimed in claim 1, wherein the second coating layer is applied 5 min to 4 hours after the first coating layer is applied, preferably 5 min to 2 hours after the first coating layer is applied.

3. The process as claimed in claim 1 or 2, wherein the coating system is a fouling release coating system.

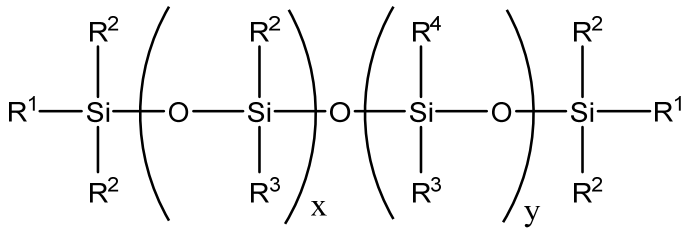
4. The process as claimed in any of claims 1 to 3, wherein the first and second coating layers comprise the same or different polysiloxane based coating compositions, preferably the same.

5. The process as claimed in any of claims 1 to 4, wherein the first and second coating layers are the outermost layers of the coating system; and/or wherein the second coating layer is the outermost layer of the coating system.

6. The process as claimed in any of claims 1 to 5, wherein the first and/or second coating layer(s) comprise one or more additive oils; and/or wherein the first and/or second coating layer(s) comprise a hydrophilic modified polysiloxane

and/or a hydrophobic modified polysiloxane; and/or wherein the first and/or second coating layer(s) comprise a biocide.

7. The process as claimed in any of claims 1 to 6, wherein the polysiloxane-based binder system comprises a polysiloxane of formula (D1):



(D1)

wherein

each R^1 is independently selected from a hydroxyl group, C_{1-6}-alkoxy group, or O-Si$(R^5)_{3-z}$ $(R^6)_z$, C_{1-6}-hydroxyl group, C_{1-6}-epoxy containing group, C_{1-6} amine group, C_{1-10} alkyl group, C_{6-10} aryl or C_{7-10} alkaryl.

each R^2 is independently selected from C_{1-10} alkyl, C_{6-10} aryl, C_{7-10} alkylaryl or C_{1-6} alkyl substituted by poly(alkylene oxide) and/or a group as described for R^1;

each R^3 and R^4 is independently selected from C_{1-10} alkyl, C_{6-10} aryl, C_{7-10} alkylaryl or C_{1-6} alkyl substituted by poly(alkylene oxide);

each R^5 is independently a hydrolysable group preferably C_{1-6} alkoxy group, an acetoxy group, an enoxy group or ketoxy group;

each R^6 is independently selected from a C_{1-6} alkyl group;

z is 0 or an integer from 1-2;

x is an integer of at least 2; and

y is an integer of at least 2.

8. The process as claimed in any of claims 1 to 7, wherein the polysiloxane based binder forms at least 50 wt% of the polysiloxane based coating composition, relative to the total weight of the polysiloxane based coating composition.

9. The process as claimed in any of claims 1 to 8, wherein the coating system is applied to a substrate, preferably a marine substrate.

10. The process as claimed in any of claims 1 to 9, wherein the coating system further comprises at least one tie coat layer and/or at least one epoxy primer layer.

11. The process as claimed in any of claims 1 to 10 wherein the crosslinking agent is organosilicon compound represented by the general formula (I) shown below, a partial hydrolysis-condensation product thereof, or a mixture of the two:

$$R_d\text{-Si-}K_{4-d} \quad (I)$$

wherein,

each R is independently selected from a monovalent hydrocarbon group of 1 to 6 carbon atoms, C_{1-6} alkyl substituted by poly(alkylene oxide) or a polysiloxane of the structure $(O\text{-}(CR^D{}_2)_{r'})_{r1'}$ – $(O\text{-}(CR^D{}_2)_{s'})_{s1'}$-(Si $(R^{PP})_2$-$O)_{t'}$-Si$(R^{PP})_3$; wherein r', r1', s' and s1' is an integer from 0-10,

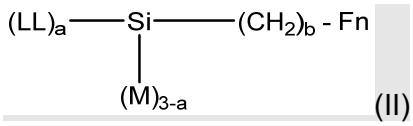
each R^D is independently selected from H or C_{1-4} alkyl,

each R^{PP} is independently selected from C_{1-10} alkyl, C_{6-10} aryl, C_{7-10} alkylaryl and t' is an integer from 1 to 50.;

each K is independently selected from a hydrolysable group preferably an alkoxy group; and

d is 0, 1 or 2, more preferably 0 or 1; or

wherein the crosslinking agent a dual crosslinking agent of formula (II):



(II)

wherein LL is independently selected from an unsubstituted or substituted monovalent hydrocarbon group of 1 to 6 carbon atoms;

each M is independently selected from a hydrolysable group preferably an alkoxy group;

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

b an integer from 1 to 6; and

Fn is an amine, epoxy, glycidyl ether, isocyanate or sulphur group.

12. The process as claimed in any of claims 1 to 11 wherein the crosslinking agent comprises 2.0 to 8.0 wt% of the polysiloxane-based coating composition.

13. The process as claimed in any of claims 1 to 12 wherein the polysiloxane based coating composition of the first coating layer contains the same crosslinker, binder, additive oil and biocide as the polysiloxane based coating composition of the second layer.

14. The process as claimed in any of claims 1 to 13 wherein the polysiloxane based coating composition of the first coating layer contains the same crosslinker, binder, additive oil and biocide as the polysiloxane based coating composition of the second layer and the same amount of crosslinker, binder, additive oil and biocide as the polysiloxane based coating composition of the second layer.

15. The process as claimed in any of claims 1 to 14 wherein the polysiloxane based coating composition of the first coating layer is the same as the polysiloxane based coating composition of the second layer.