WO 2012/083292 discloses a stain resistant, oil and water repellent composition comprising a copolymer of fluorinated methacrylate, carbonate methacrylate and methacrylic acid or salt thereof.

FATOUMATA CAMARA ET AL, EUROPEAN POLYMER JOURNAL., vol. 61, 1 Dec. 2014 (2014-12-01), pages 133-144, discloses free radical polymerization of (2-oxo-1,3-dioxolan-4-yl)methyl methacrylate (GCMA).

US 5,045,602 discloses moisture-hardening binder compositions based on copolymers containing anhydride and carbonate groups and compounds containing blocked amino groups which are suitable for crosslinking the copolymers.

US 4,882,391 discloses non-crosslinked reaction products of compounds (A) which contain structural units carrying 1,3-dioxolan-2-one groups and compounds (B) which contain at least one primary aliphatic or cycloaliphatic amino group and additionally at least one further basic amino group.

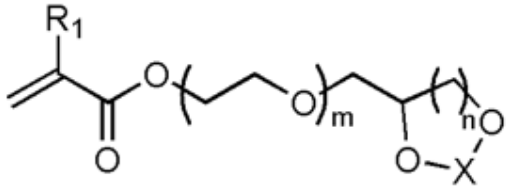
WO 2012/130718 discloses a two component coating composition which do not comprise any polyisocyanates or melamine-formaldehyde resins as crosslinkers for curing.

SUMMARY

It has been found by the present inventor(s) that carbon-based hydrolysable polymers comprising monomers of general formula I (see further below) can provide, or improve the antifouling properties of, a coating composition comprising an erodible binder system.

So, in an embodiment, the present disclosure relates to an antifouling coating composition.

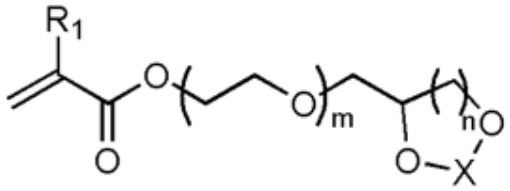
In an aspect, there is provided an antifouling coating composition comprising an erodible binder system, wherein said binder system comprises a polymer of ethylenically unsaturated monomers, said monomers including at least one monomer of the general formula I:



wherein m is 0-50, n is 1-3, R_1 is selected from hydrogen and methyl, and X is selected from

>C=O or >C(R_2)(R_3), where R_2 and R_3 are independently selected from hydrogen, C_{1-20}-alkyl and aryl.Another embodiment of the disclosure relates to an antifouling coat, wherein said erodible binder system comprises one or more further binder component.

In another aspect, there is provided an antifouling coat comprising an erodible binder system, wherein said binder system comprises a polymer of ethylenically unsaturated monomers, said monomers including at least one monomer of the general formula I:



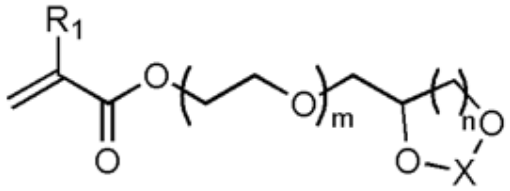
wherein m is 0-50, n is 1-3, R_1 is selected from hydrogen and methyl, and X is selected from >C=O or >C(R_2)(R_3), where R_2 and R_3 are independently selected from hydrogen, C_{1-20}-alkyl and aryl, and one or more pigments and fillers, wherein said erodible binder system comprises one or more further binder component.

Another embodiment of the disclosure relates to a marine structure.

In another aspect, there is provided a marine structure comprising on at least a part of the outer surface thereof an outermost antifouling coat as defined above.

Another embodiment of the disclosure relates to the use of carbon-based hydrolysable polymer(s) as a co-binder for improving the antifouling properties of a coating composition comprising an erodible binder system.

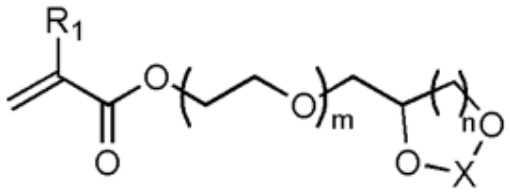
In another aspect, there is provided the use of one or more polymer(s) of ethylenically unsaturated monomers, said monomers including at least one monomer of the general formula I:



wherein m is 0-50, n is 1-3, R_1 is selected from hydrogen and methyl, and X is selected from

CLAIMS

1. An antifouling coating composition comprising an erodible binder system, wherein said binder system comprises a polymer of ethylenically unsaturated monomers, said monomers including at least one monomer of the general formula I:



wherein m is 0-50, n is 1-3, R_1 is selected from hydrogen and methyl, and X is selected from >C=O or >C(R_2)(R_3), where R_2 and R_3 are independently selected from hydrogen, C_{1-20}-alkyl and aryl, wherein said erodible binder system comprises one or more further binder component.

2. The antifouling coating composition according to claim 1, wherein said one or more further binder component is a rosin.

3. The antifouling coating composition according to any one of the preceding claims, wherein the binder system constitutes 15-75 % by dry weight of the coating composition.

4. The antifouling coating composition according to any one of the preceding claims, wherein m is 1-12.

5. The antifouling coating composition according to any one of the preceding claims, wherein n is 1-3.

6. The antifouling coating composition according to any one of the preceding claims, wherein X is >C=O.

7. The antifouling coating composition according to any one of the preceding claims, wherein X is >C(R_2)(R_3), wherein R_2 and R_3 both are methyl.

8. The antifouling coating composition according to any one of the preceding claims, wherein the monomer of formula I is at least one of (2,2-dimethyl-1,3-dioxolan-4-yl)methyl (meth)acrylate (IPGA/IPGMA), isopropylidene glycerol ethoxylated (meth)acrylate (iPGEO(M)A) and (2-oxo-1,3-dioxolan-4-yl)methyl (meth)acrylate (GCA/GCMA).

9. The antifouling coating composition according to any one of the preceding claims, wherein the monomers of formula I in total constitutes 5-100 % by weight of the polymer.

10. The antifouling coating composition according to any one of the preceding claims, wherein the monomer of formula I is at least one of (2,2-dimethyl-1,3-dioxolan-4-yl)methyl methacrylate (IPGMA), isopropylidene glycerol ethoxylated methacrylate (iPGEOMA) and (2-oxo-1,3-dioxolan-4-yl)methyl acrylate (GCA).

11. The antifouling coating composition according to any one of the preceding claims, wherein the ethylenically unsaturated monomer(s) other than those of general formula I are selected from (meth)acrylates.

12. The antifouling coating composition according to any one of the preceding claims, wherein the ethylenically unsaturated monomer(s) other than those of general formula I are selected from methyl (meth)acrylate (MA/MMA), methoxy ethyl (meth)acrylate (MOXEA/MOXEMA), butyl (meth)acrylate (BA/BMA), styrene, triisopropylsilyl(meth)acrylate (TiPS(M)A) and (meth)acrylic acid (AAc/MAAc).

13. The antifouling coating composition according to any one of the preceding claims, wherein the polymer has a molar ratio of monomers of general formula I to other ethylenically unsaturated monomers of 20:80 to 80:20.

14. The antifouling coating composition according to any one of the preceding claims, wherein the polymer is a bis-polymer of MMA and one of IPGA/IPGMA, iPGEOA/iPGEOMA and GCA/GCMA.

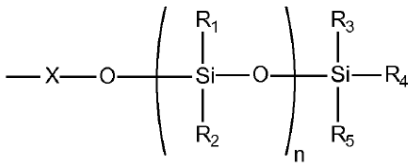
15. The antifouling coating composition according to any one of the preceding claims, wherein the monomers of general formula I in total constitute 25-95 % by weight of the polymer.

16. The antifouling coating composition according to any one of the preceding claims wherein the ethylenically unsaturated monomer(s) other than those of general formula I in total constitute 5-75 % by weight of the polymer, such as 30-70 % by weight of the polymer.

17. The antifouling coating composition according to any one of the preceding claims, wherein the polymer constitutes 2-60 % by solids volume of the coating composition.

18. The antifouling coating composition according to any one of the preceding claims, wherein the coating composition as a part of the binder system further comprises as a co-

binder a silylated acrylate co-polymer having at least one side chain bearing at least one terminal group of the general formula (A):



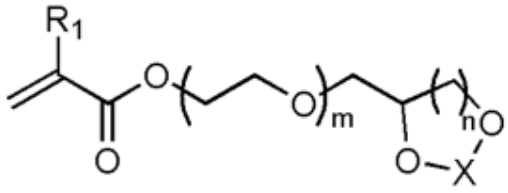
(A)

wherein n is an integer of 0-100, X is –C(=O)-, and R_1, R_2, R_3, R_4 and R_5 are each independently selected from C_{1-20}-alkyl and optionally substituted aryl.

19. The antifouling coating composition according to any one of the preceding claims, wherein the coating composition further comprises as a co-binder a non-aqueous dispersion binder component, wherein said binder component comprises a resin having a core-shell structure which is constituted of (a) a hydrophilic core component comprising a polymer of ethylenically unsaturated monomers, and (b) a shell component comprising a polymer of ethylenically unsaturated monomers.

20. The antifouling coating composition according to any one of the preceding claims, which exhibits a polishing rate of at least 0.5 µm per 10,000 Nautical Miles as determined in accordance with the Polishing Rate Test defined herein.

21. An antifouling coat comprising an erodible binder system, wherein said binder system comprises a polymer of ethylenically unsaturated monomers, said monomers including at least one monomer of the general formula I:

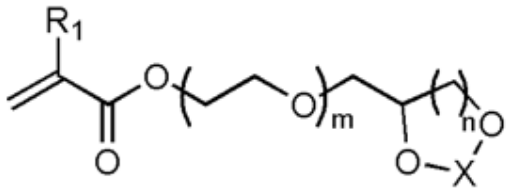


wherein m is 0-50, n is 1-3, R_1 is selected from hydrogen and methyl, and X is selected from >C=O or >C(R_2)(R_3), where R_2 and R_3 are independently selected from hydrogen, C_{1-20}-alkyl and aryl, and one or more pigments and fillers, wherein said erodible binder system comprises one or more further binder component.

22. The antifouling coat according to claim 21, wherein the polymer constitutes 2-60 % by solids volume of the coat and wherein the one or more pigments and fillers constitute 5-45 % by solids volume of the coat.

23. A marine structure comprising on at least a part of the outer surface thereof an outermost antifouling coat as defined in any one of the claims 21-22.

24. The use of one or more polymer(s) of ethylenically unsaturated monomers, said monomers including at least one monomer of the general formula I:



wherein m is 0-50, n is 1-3, R_1 is selected from hydrogen and methyl, and X is selected from >C=O or >C(R_2)(R_3), where R_2 and R_3 are independently selected from hydrogen, C_{1-20}-alkyl and aryl,

as a co-binder for improving the antifouling properties of a coating composition comprising an erodible binder system.