non-hydrophilic BMA/MMA copolymer). None of the disclosed silyl copolymers have a hydrophilic monomer content above 10 wt%, i.e. the hydrophilic binder component of the present invention is lacking.

WO2011/131721 describes coating composition which is produced by adding the different components in a specific order (e.g. drying agent). In the examples rosin is used together with Neocryl B725 (a non-hydrophilic BMA/MMA copolymer) and Polyace NSP-100 (silyl acrylate). No hydrophilic comonomers are used in Neocryl B725.

WO2014/175140 describes a silyl copolymer with specific end groups.

EP3078715 covers an antifouling coating composition comprising a silyl ester copolymer, tralopyril and a stabilizer. In the examples a triisopropylsilyl methacrylate copolymer, gum rosin and an acrylic polymer are used. The monomer composition or the polymer properties of the acrylic copolymer is not specified.

WO2009/149919 patent covers the use of caprolactone modified comonomers in a silyl copolymer. No additional acrylic polymer is used.

EP2489710 exemplifies antifouling coatings and exemplifies two acrylic acid copolymers T3 and T4. These are combined with rosin and a vinyl chloride-isobutylvinyl ether copolymer).

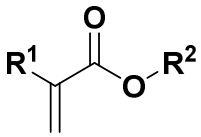
In EP2161316 and the related US2011/0166253, the binder is based on a rosin component and a silyl ester component, i.e. the third binder component of the present invention is lacking.

The combination of components required in the claims is new and offers remarkable results.

Summary

In a first example the disclosure provides a binder for an antifouling coating composition comprising:

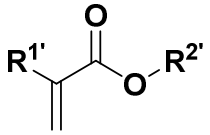
(i) a hydrophilic copolymer having a glass transition temperature of at least 0°C comprising at least 10 wt% of at least one monomer of Formula (I)



(I)

wherein R^1 is H or CH_3, and R^2 is a C3-C18 substituent with at least one oxygen or nitrogen atom, preferably at least one oxygen atom or R^2 is a poly(alkylene glycol) chain;

and at least one monomer of Formula (II),



(II)

wherein $R^{1'}$ is H or CH_3, and $R^{2'}$ is a C1-C20 hydrocarbyl;

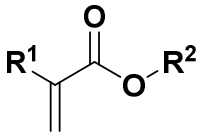
said hydrophilic copolymer comprising less than 15 wt% comonomers other than those of Formula (I) or (II);

(ii) a cyclic monocarboxylic acid such as rosin or a derivative thereof (such as a salt thereof); and

(iii) a silyl ester copolymer comprising at least 15 wt% of silyl ester monomer and/or a non-hydrophilic (meth)acrylic polymer comprising less than 10 wt% of monomer according to Formula (I), preferably less than 5 wt%, most preferably 0 wt% of monomers of Formula (I).

In one aspect, the present disclosure refers to a binder for an antifouling coating composition comprising:

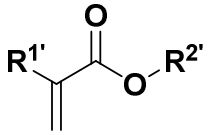
(i) a hydrophilic copolymer having a glass transition temperature of at least 0°C, said hydrophilic copolymer comprising at least 10 wt% of at least one monomer of Formula (I)



(I)

wherein R^1 is H or CH_3, and R^2 is a C3-C18 substituent with at least one oxygen or nitrogen atom, preferably at least one oxygen atom or R^2 is a poly(alkylene glycol) chain;

and at least one monomer of Formula (II),



(II)

wherein $R^{1'}$ is H or CH_3, and $R^{2'}$ is a C1-C20 hydrocarbyl;

said hydrophilic copolymer comprising less than 15 wt% comonomers other than those of Formula (I) or (II);

(ii) a cyclic monocarboxylic acid such as rosin or a derivative thereof (such as a salt thereof); and

(iii) a silyl ester copolymer comprising at least 15 wt% of silyl ester monomer and/or a non-hydrophilic (meth)acrylic polymer which comprises less than 10 wt% of a monomer of Formula (I).

The amount of component (i) in the binder is preferably in the range of 20 to 60 wt% (dry solids). The amount of component (ii) in the binder is preferably in the range of 10 to 70 wt% (dry solids). The amount of component (iii) in the binder is preferably in the range of 5 to 70 wt% (dry solids).

The disclosure also provides an antifouling coating composition comprising a binder as described herein, preferably dispersed in a solvent. The antifouling coating may further comprise an antifouling agent, preferably cuprous oxide, zinc ethylenebis(dithiocarbamate) and/or copper pyrithione.

In another aspect, the present disclosure refers to an antifouling coating composition comprising a binder as disclosed herein and at least one antifouling agent.

In another aspect, the present disclosure refers to a process for protecting an object from fouling, said process comprising coating at least a part of said object which is subject to fouling with an antifouling coating composition as disclosed herein.

The disclosure also relates to objects coated with the antifouling coating composition as defined herein or to the use of the antifouling composition of the disclosure to protect a marine surface from fouling.

In another aspect, the present disclosure refers to an object coated with the antifouling coating composition as disclosed herein.

Definitions

The term "marine antifouling coating composition", "antifouling coating composition" or simply "coating composition" refers to a composition which is suitable for use in marine environments. The antifouling coating composition preferably contains an antifouling agent, e.g. a biocide.

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 "(meth)acrylate" means a methacrylate or acrylate.

The term "poly(alkylene oxide)" refers to a compound comprising –[alkylene-O]- repeat units. Typically the alkylene is ethylene or propylene.

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

The term "binder" defines part of the composition which includes the copolymers and cyclic monocarboxylic acid, and any other components which together form a matrix giving substance and strength to the composition. The "binder" includes the polymer components (i) and (iii) along with the cyclic monocarboxylic acid (ii).

The term non-hydrophilic (meth)acrylic polymer defines a polymer that comprises at least one (meth) acrylic acid monomer or at least one (meth)acrylate monomer (or potentially both) but comprises less than 10 wt% of monomer according to Formula (I), preferably less than 5 wt%, most preferred 0 wt% of a monomer of Formula (I). When less than 10 wt% of monomer of Formula (I) is present, this is deemed non-hydrophilic.

Where a wt% of a given monomer is given, the wt% is relative to the sum total (weight) of each monomer present in the copolymer. Thus if 2-methoxyethyl