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Antifouling Compounds: A Systematic Study on structure-property relationship

E.R.SILVA[1, 2*]; O. Ferreira[1]; J.C.BORDADO[1]; Maria José Calhorda[2]

[1]*Instituto Superior Técnico, Departamento de Engenharia Química, Universidade Técnica de Lisboa, Portugal,*

[2] *Universidade de Lisboa, Faculdade de Ciências, Centro de Química e Bioquímica/Departamento de Química e Bioquímica (CQB/DQB), Lisboa, Portugal*

[*] Presenting author: *elisabetesilva@ist.utl.pt*

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Water is the basis of all livings micro and macroorganisms: they can live longer without food than without water. There are a wide variety of micro and macroscopic organism species that use flowing water to provide them with nutrients but also to transport them to other locations which can offer better conditions for their survival. *Biofouling* is a term used to define the adhesion and growth of such species on submerged surfaces. On engineering surfaces (pipes for water supply, ships or aquaculture facilities), this Biofouling can be responsible for serious human healthy infections [1] or even induce substrate deterioration or improper devices function [2], thus, leading to substantial economic losses and environmental issues. In Marine transportation industry, it can lead to delivery delays, increasing fuel expenditure and augmented emissions of polluting gases such as SO2, NOx, and CO_2. The International Maritime Organization (IMO, 2009) estimates that gas emissions due to increased fuel consumption could increase up to 72% by 2020. Protection strategies against this biological attack have been extensively exploited [3]. Hitherto, antifouling biocide-releasing coatings seem to be the most effective method, but the environmental toxicity of these biocides is increasing calls for legislation. New regulatory restrictions expected from EU Commission in 2013 may compromise the availability of the antifouling compounds currently in use. Bioinspired antifouling materials, obtained from the identification and extraction of Natural Product Antifoulants (NPAs) or design of synthetic chemical coatings that mimic natural fouling defence mechanism, have been proposed [3]. However, despite their environmental benefits, one of the major problems hampering their development into an industrial scale is their limited production, which does not fulfill the demand needs. Recent studies boosted new non-release antifouling systems [2], most of them based on physico-chemical properties and on newly bioinspired systems, for instance, antimicrobial polymers and tethered antifouling compounds. The main aim of this work is to identify potential antifouling compounds able to be immobilized in a polymeric matrix (silicone, polyurethane and epoxy), suitable for coating systems. Preliminary tests done on polyurethane based systems revealed that compounds possessing amine and/or hydroxyl groups have potential to be immobilized in such systems. A list of potential antifouling compounds was selected. Supports were provided by a FP7 and FCT Projects for this work.

References

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