Marine Coatings: New Non-Release Antifouling Systems

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Biofouling is a spontaneous unwanted colonization of submerged surfaces by a diversity of organisms. It can cause serious detrimental effects on submerged surfaces and subsequent economic and environmental penalties. It is for instance the cause of hydrodynamic drag increasing in ships and thereby fuel consumption and greenhouse gas (SO_2, NOx, CO_2) emissions also increasing [1]. Protection strategies against such organisms substrate adhesion have been extensively exploited [2, 3]. To date the most effective strategy is to use antifouling biocide-releasing coatings, but the ecologically harmful toxicity of these biocides has led to strict regulations for their use, and those expected to come in 2013 will restrict even further the antifouling biocides currently in use. Therefore, greener antifouling alternative are sought. In this work, we propose a new approach for non-release antifouling marine coatings, consisting of the functionalisation of new or already proved biocide compounds (e.g. commercially available) with a functional group which possesses the ability to be covalently bonded to conventional silicone or polyurethane (PU) based marine coatings. Commercial biocides, such as Irgarol, have been already successful derivatised using this approach. The resulting derivatised biocides evidenced 7 to 11% (m/m) of the functional group, which is quite similar to the expected theoretical one (7%). FTIR analyses confirmed that the structure was not modified and that the functional group was successful attached to the expected bridging point. Toxicity and bacteriologic analysis revealed potential activity, with some relatively expected loss when compared to the non-derivatised compounds. The ultimate goal of this work, which is supported by a European FP7 Programme and FCT Portuguese Foundation, is to produce non-release coatings, primarily for marine systems.

References

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