

Chitosan-based nanocapsules to prevent marine biofouling

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Biofilm is a complex structure which consists of a dense network of microbial cells enclosed within a polymeric matrix. Bacteria, algae, and fungi are able to produce biofilms on biotic and abiotic surfaces in marine environment. Biofilm formation in naval industry causes serious economic losses and problems due to biofouling and biocorrosion. One of the anti-biofilm strategy is to develop new anti-fouling coatings containing a natural or synthetic biocide. In this work, chitosan-based nanocapsules loaded with two new synthetic antibiofilm molecules were prepared, with the aim to control the release of the biocides from the coating. Chitosan-based nanocapsules are able to release biocides "on demand", in response to the increase in environmental pH, due to the secretions produced by bacterial metabolism and thus prevent the formation of biofilms. The obtained nanocapsules were characterized by Scanning Electron Microscopy (SEM), Atomic Force microscopy (AFM), Dynamic Light Scattering (DLS) and potential measurements. In addition, by UV-Vis spectroscopy, the percentage of encapsulation and the release capacity of the active substance were determined. Finally, the nanocapsules were incorporated in coating systems and applied to carbon steel samples. Microbiological tests to assess the ability to inhibit the adhesion of marine biofilms on these kind of surfaces are undergoing.