Marine Biofouling Topical Conference

Room: 4C - Session MB+BI-TuP

Marine Biofouling Poster Session

MB+BI-TuP1 Contact Angle Analysis for Barnacle Adhesives, ***E.R. Holm***, *R.A. Brizzolara*, Naval Surface Warfare Center, Carderock Division

The key step in the accumulation of biofouling on immersed surfaces is the permanent attachment of fouling organisms. Patterns of attachment and adhesion of biofouling, in response to surface properties, vary both among and within species. This variation may be mediated by interactions between surfaces and biological adhesives. We have been studying this interaction for the barnacle, Balanus amphitrite. Our initial approach addresses the propensity of barnacle adhesive to wet modified glass surfaces and commercially-available and experimental silicone fouling-release coatings. Glass surfaces were modified with various organosilane coatings to produce a range of water wettabilities. We verified attachment of organosilane to glass with XPS. We have been quantifying wetting by barnacle adhesive as contact angle. Preliminary results, for modified glass surfaces, indicated that for hydrophilic surfaces, contact angles for adhesive were equivalent to that for water. As surfaces became more hydrophobic, however, contact angles for barnacle adhesive became more variable than those for water. Individual measurements were occasionally substantially lower than typical water contact angles. Differences in contact angle among adhesive samples may be related to the protein content of the adhesive, which varies strongly among individual barnacles. Results will be related to attachment of larval barnacles and adhesion of adult barnacles. Funded by the NSWC Carderock Division In-House Laboratory Independent Research Program.

MB+BI-TuP2 Poly(ethylene glycol)-based Anti-biofouling Surfaces, ***T. Ekblad***, *G. Bergström, C.-X. Du, T. Ederth, B. Liedberg*, Linköping University, Sweden

This work describes the fabrication, characterization and biological evaluation of homogeneous and patterned hydrogel films, used as model coatings in anti-fouling experiments. The work is a part of an EC-initiative on Advanced Nanostructured Surfaces for the Control of Biofouling, AMBIO. The hydrogels consist of poly(ethylene glycol)-containing methacrylate monomers that are UV-grafted onto solid supports, e.g. silanized glass. The physical and chemical properties of these films have been studied using ellipsometry, FT-IR, AFM and a range of other surface characterization techniques. A key property of the hydrogels is that they appear to be resistant to protein adsorption from complex biofluids, including plasma and serum.[1] These observations encouraged us to test the hydrogels as anti-fouling surfaces. Hydrogels, ca. 30 nm thick, were prepared and evaluated in settlement and removal assays using a range of organisms, including barnacle cyprids of the species Balanus amphitrite, Ulva linza zoospores, Navicula diatoms and the three bacteria species Cobetia marina, Marinobacter hydrocarbonoclasticus and Pseudomonas fluorescens. It is clear from the results that the hydrogel surfaces display excellent antifouling properties. All tested organisms displayed significantly reduced settlement compared to reference coatings. The removal of settled organisms generally appeared to be less affected by the surface coating. Though the relationship is not yet confirmed, this study demonstrates that a surface with low protein adsorption also can have advantageous anti-biofouling properties. The broad-spectrum effect of the hydrogel coating does undoubtedly imply that the selected poly(ethylene glycol) chemistry acts on a fundamental stage in the settlement process of biologically diverse organisms. This stage may be the adsorption of biomolecules from glues released by the settling organisms.

[1] A. Larsson, T. Ekblad, O. Andersson, B. Liedberg, Biomacromolecules 2007, 8, 287-295.

MB+BI-TuP3 The Dynamics of Two Species of Megabalanus (Crustacea: Cirripedia: Balanidae) by a Cellular Automata Model, ***M. Apolinário***, PETROBRAS, Brazil, *A. Racco*, LNCC, Brazil

The Cellular Automata (CA) model was used in a computational simulation between an introduced species in Brazilian, Rio de Janeiro State's waters Megabalanus coccopoma and a cryptogenic species Megabalanus tintinnabulum (Crustacea: Cirripedia: Balanidae), obtaining a time series where M. tintinnabulum firstly occurs alone and then it interacts with the entrance of M. coccopoma in the system. The simulation also gets data about spatial distribution of both species and column formation, representing the specimens' assessment one above the other, as it occurs at the natural environment. The results show that total recruitment of each species within the maximum height of the columns is important for the predominance of the introduced species in comparison with the cryptogenic one. The comparison between CA model and natural distribution of both species shows that CA represents significantly the interaction between both species of barnacles in the studied area.

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