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Bio-inspired Design Approached Antifouling Strategies

L. Fitzsimons, J. Chapman, A. Lawlor, and F. Regan

Marine Environmental Sensing Technology Hub (MESTECH), National Centre for Sensor Research, Dublin City University, Dublin, Ireland (james.chapman@dcu.ie)

Biofouling exists as the undesirable accumulation of flora and fauna on a given substrate when immersed into an aquatic media. Its presence causes a range of deleterious effects for anyone faced in tackling the problem, which is more than often financially testing. Generally, the initial biofouling stage is stochastic and the attachment of microorganisms held fast in biofilm matrices is irreversible. Stability of the biofilm occurs when exopolymeric substances (EPS) are produced forming a protective surrounding, allowing the cohered microorganisms to colonise and thrive upon the surface. Therefore, if this initial stage of biofilm development can be prevented then it could be possible to prevent subsequent macro events that ensue. Environmental monitoring is one area that faces this challenge and forms the impetus of the work presented herein. In order to improve a monitoring device's lifetime, surface coatings with biocidal agents are applied to counteract these steps. This work shows the development of a range of novel materials, which demonstrate the ability to counteract and inhibit the initial stages of biofouling for monitoring devices. Natural bio-inspired surfaces have been developed using nano-functionalised coatings. All materials are tested in the field and positive results in reducing the biofouling challenge are demonstrated. The results from the deployment of antifouling materials, together with real-time, long-term water quality data from the test site are also shown.