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Abstract

Fabrication of Micro-Structured Surface Topologies for the Promotion of Marine Bacteria Biofilm †

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Abstract: Several marine bacteria of the *Roseobacter* group can inhibit other microorganisms and are especially antagonistic when growing in biofilms. This aptitude to naturally compete with other bacteria can reduce the need for antibiotics in large scale aquaculture units, providing that their culture can be promoted and controlled. Micropatterned surfaces may facilitate and promote the biofilm formation of species from the *Roseobacter* group, due to the increased contact between the cells and the surface material. Our research goal is to fabricate a biofilm with optimal micro patterned surfaces and investigate the relevant length scales for surface topographies, as well as the surface chemistry, which can promote growth and biofilm formation of the *Roseobacter* group. In a preliminary study, silicon surfaces comprising arrays of pillars and pits with different periodicities, diameters and depths were produced by UV lithography and deep reactive ion etching (DRIE) on single-side polished silicon wafers. The resulting surface microscale topologies were characterized using optical profilometry and scanning electron microscopy (SEM). Screening of the bacterial biofilm on the patterned surfaces was performed using green fluorescent staining (SYBR green I) and confocal laser scanning microscopy (CLSM). Different series of experiments were conducted by changing several parameters, such as growth time, shear stress corresponding to particular revolution per minute (rpm) and growth media. Preliminary results indicate that there is a correlation between the surface morphology, and the spatial organization of the bacterial biofilm. Our results indicate that further investigation leading to optimization of surface topology and surface chemistry will allow us to microfabricate polymer material surfaces where biofilm colonization is enhanced. Such surfaces will enable the introduction of beneficial bacteria in a variety of industrial processes, including aquaculture.

Keywords: structured surfaces; silicon surfaces; microfabrication; bacterial biofilm; microbial adhesion

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