Biomimetic topographic gradient for marine antifouling study

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Abstract: For the development of environmentally friendly antifouling coatings, it is important to understand the interaction between marine organisms and surfaces in greater detail [1, 2]. Among the different surface cues, the settlement of cells and larvae has been found to be influenced by surface microtopography[3]. In this study, the influence of surface topographic gradients on the settlement of zoospores of the green alga *Ulva* was investigated. Honeycomb structures, which could be found widely in nature, such as the skin of the pilot whale[4], the shell of the turtle and the eyes of mosquito, etc. has been considered to facilitate the antifouling function of natural surfaces. A size gradient of honeycomb microstructures were prepared by hot embossing [5], and the effect on the density of spores that attached in laboratory assays was quantified. The highest density of spores was found when the size of the microstructures was similar to or larger than the size of a spore. With decreasing size of the honeycombs, spore settlement decreased. Interestingly, spore settlement correlated with the Wenzel roughness of the surfaces. During settlement, "kink positions" on the surface played an important role and resembled preferred attachment positions. The gradients furthermore allowed determining the minimum pit size chosen by the spores to squeeze in and settle.

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