Nature-inspired antifouling and anticorrosion coatings

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Abstract Marine biofouling is the attachment of fouling organisms (e.g., bacteria, algae, and barnacles) on wetted surfaces, and it is a major issue for the marine industry [1]. Since toxic antifouling coatings were banned globally due to their negative impacts on the marine environment, the development of environmental-friendly and efficient antifouling coatings has been identified as a pressing need.

In evolution, corals have developed several excellent antifouling strategies to prevent the settlement of fouling organisms [2]. For example, the fluorescent coral can inhibit biofouling by emitting fluorescence, and the soft coral (Sarcophyton trocheliophorum) combats biofouling by releasing natural antifoulants and swinging its soft tentacles. Inspired by the fluorescent coral, sandwich-structure fluorescent coatings were fabricated and tested [3]. Results showed that fluorescence could inhibit algal settlement, whereas it showed no effect on bacterial adhesion. The second coating was inspired by the soft polyps of *S. trocheliophorum*, and artificial polyps were fabricated and tested [4]. Results suggested that the tentacles could constitute an unstable surface under flow, thereby preventing the fouling organisms from adhering to such a dynamic surface.

In harsh marine environment, subsea equipment suffers from corrosion, cavitation, and antifouling. We developed a series of multifunctional coatings to address the aforementioned problems [5]. These coatings exhibited excellent anticorrosion, anticavitation, antifouling, and self-healing properties.In general, these coatings are characterized by environmental friendliness and efficiency. They demonstrate a massive potential for practical application in marine vessels.

Reference

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