Novel Eco-Friendly Anti-fouling Material with Controlled Release of Copper Ions for Freshwater and Marine Environments

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Abstract Biofouling poses severe hazards to marine underwater infrastructures and is a key factor in species invasion. The issue of biofouling in freshwater environments should not be overlooked either, as it disrupts the balance of ecosystems and poses grave threats to human health and the sustainable use of water resources. Although there are similarities in the biofouling process between freshwater and marine environments, especially in the stages of conditioning film formation, biofilm development, microfouling, and macrofouling, there are significant differences in environmental conditions (e.g., pH values, flow velocity), species diversity, and management strategies. In response to this challenge, Hong and colleagues have developed an environmentally friendly underwater anti-fouling metal. This material's controlled release of copper ions is particularly suited for resisting the initial attachment of biofouling. By releasing high concentrations of copper ions in microareas on the surface, it inhibits the attachment of proteins and polysaccharides without releasing large amounts of copper ions into the surrounding aquatic environment, reducing the adhesion strength of biofilms and preventing their formation, thereby significantly delaying the progression of biofouling. This technology aims to meet the wide-ranging anti-fouling needs of both freshwater and marine environments, showing broad-spectrum anti-fouling effects in both static and dynamic waters, and is poised to lead the development of the next generation of anti-fouling technology.

Keywords Eco-friendly; Freshwater; Controlled release; Biofouling; Metal

Reference

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