

## Research on Anticorrosion and Antifouling Coatings for Marine Pastures

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**Abstract:** As a sustainable and efficient approach to marine resource development, marine pastures are gaining increasing recognition in the global aquaculture industry. However, various facilities within these environments, such as cages, buoys, ropes, and pipes, are highly susceptible to biofouling. Biofouling increases the weight and hydrodynamic resistance of structures, causing material wear, corrosion, and reduced service life. It also negatively impacts environmental factors like water flow and light penetration. These changes can deteriorate the quality of the aquaculture environment and elevate the risk of infectious diseases among cultured species. Consequently, the effective prevention of biofouling is critical to ensuring the sustainability and economic viability of marine pastures. To address this challenge, a polydimethylsiloxane (PDMS)-modified phenolic resin has been utilized as a coating material to enhance surface hydrophobicity and provide improved elasticity and flexibility. In addition, halloysite nanotubes were surface-modified by introducing smart-responsive organic chains and grafting natural organic biocides, while concurrently loading metal nanoparticles. This innovative anti-corrosion and antifouling nanocomposite coating significantly enhances the coating's density and resistance to biofouling. Antimicrobial tests demonstrated that this nanocomposite exhibits long-lasting bactericidal effects against *Bacillus* and *Pseudoalteromonas* species. This multifunctional coating material presents a promising solution for protecting marine ranch facilities from corrosion and biofouling, thereby supporting their sustainable development and improving economic outcomes.

**Keywords:** Marine pastures, Polydimethylsiloxane, Halloysite nanotubes, Surface-modified.