

Design and Synthesis of Benzamide Derivatives as Antifouling Agents

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Abstract Marine biofouling significantly impairs maritime vessels, affecting navigation speed and increasing fuel usage. Antifouling coatings, traditionally containing toxic biocides like organotin and DDT, are used to prevent marine organisms from attaching. However, due to environmental concerns, these biocides are being phased out, prompting the need for eco-friendly alternatives.

This investigation builds upon previous studies focusing on phenolic compounds from *Ranunculaceae* plants and amide compounds from *Ulvaceae* plants. Using these as templates, a variety of benzamide derivatives were designed to study their antifouling effects. Three structurally similar benzamide compounds, HNOB, DOLPA, and DHNOB, were synthesized, with HNOB showing the best antifouling activity. Structural analysis revealed that the combination of polar and non-polar elements in these compounds enhanced their antifouling properties. HNOB was chosen as an antifouling ingredient and reacted to form HNOBA, which was then used to create PBNH-Ax copolymers. These copolymers formed films at room temperature with good interlayer adhesion. Experiments showed that HNOB, released through ester hydrolysis, effectively prevented diatom attachment and exhibited antimicrobial properties.

This research outlines the synthesis of innovative antifouling molecules from natural product derivatives and their integration into polymer chains, demonstrating their potential for marine antifouling applications. Future research should investigate the long-term stability and effectiveness of these materials in real marine conditions and their ability to combat a wide range of fouling organisms.

Keywords *Marine biofouling, Antifouling, biocides, benzamide, Synthesis*

Reference

[1] Jiyong Zheng, Haiping Gao, et al. Design and synthesis of a new bioactive compound for marine antifouling inspired by natural products, NATURAL PRODUCT RESEARCH, 2024, VOL. 38, NO. 9, 1624–1628