Macrophage-Inspired Marine Antifouling Coating with Dynamic Surfaces based on Regulation of Dynamic Covalent Bonds

Chao Wang[1], Rongrong Chen*,[1,2], Wenbin Liu[1], Gaohui Sun[1], Peili Liu[1], and Jun Wang*,[1,2]

[1] Key Laboratory of Superlight Materials and Surface Technology, Ministry of Education, College of Materials Science and Chemical Engineering, Harbin Engineering University, Harbin, China.

[2] Nanhai Institute of Harbin Engineering University, Hainan, China.

**chenrongrong95@163.com, junwang@hrbeu.edu.cn.*

Abstract Macrophages can kill bacteria and viruses by releasing free radicals, which provides a possible approach to construct antifouling coatings with dynamic surfaces that release free radicals if the breaking of dynamic covalent bonds is precisely regulated. Herein, inspired by the defensive behavior of macrophages, a marine antifouling coating composed of polyurethane incorporating dimethylglyoxime (PUx-DMG) is prepared by precise regulation of dynamic oxime-urethane covalent bonds. The obtained alkyl radical (R·) derived from the cleavage of the oxime-urethane bonds manages to effectively suppress the attachment of marine biofouling. Moreover, the intrinsic dynamic surface makes it difficult for biofouling to adhere and ultimately achieves sustainable antifouling property. Notably, the PU_{50}-DMG coating not only presents efficient antibacterial and antialgae properties, but also prevents macroorganisms from settling in the sea for up to 4 months. This provides a pioneer broad-spectrum strategy to explore the marine antifouling coatings.

Keywords Antifouling; Dynamic covalent bonds; Polyurethanes; Bioinspired Dynamic surfaces

Reference

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