

**Controllable release of Cu ions contributes to the enhanced environmentally-friendly performance of antifouling Cu-bearing stainless steel coating prepared using high-velocity air fuel**

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**Abstract** Organic antifouling coatings represent an economical and efficient solution for addressing the marine biofouling. However, their application is constrained by issues of durability and toxicity. Therefore, this study has developed a metal-based antifouling coating by utilizing pre-alloyed copper-bearing stainless steel (Cu-bearing SS) powder in conjunction with high-velocity air fuel (HVOF) technology, aiming to achieve an environmentally-friendly and long-lasting antifouling coating. Compared to the self-polishing copolymer (SPC) coating, the adhesion strength of Cu-bearing SS coating increased to 69.0 MPa, which is approximately a 33-fold increase. The coating also exhibited enhanced wear resistance, the width and depth of the wear track for the Cu-bearing SS coating decreased 42.9% and 81.0%, respectively. Furthermore, the coating still demonstrated strong inhibitory effects on typical fouling microorganisms and algae adhesion due to Cu ions release process environmentally-friendly. The electrochemical techniques coupling with surface morphology observations were used to elucidate the antifouling mechanism. The variation trend of coating corrosion current was consistent with the release process of Cu ions, which was directly related to the evolution of the coating surface morphology. The three-stage change in the surface morphology of the 304L-Cu SS coating contributes to the formation of a cyclic variation trend process of Cu ions. The evolution of surface morphology, accompanied by the controlled release process of Cu ions, had become a distinctive feature of antifouling properties for a metal-based coating [1].

**Keywords** Marine antifouling coating; Cu-bearing stainless steel; High-velocity air fuel; Metal-based coating

## Reference

[1] J. Zhao, T. Lian, Z. Sun, H. Zhao, C. Yang, X. Fan, S. Li, J. Mao, C. Deng, K. Yang, Controllable release of Cu ions contributes to the enhanced environmentally-friendly performance of antifouling Cu-bearing stainless steel coating prepared using high-velocity air fuel, *Surface and Coatings Technology*, 481 (2024) 130629.