Preparation of photothermal-electrothermal synergistic superhydrophobic anti-icing coatings by resin modulation strategy

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Abstract: Ice accumulation is a common phenomenon in nature, but this phenomenon may seriously interfere with people's daily life and production activities, and even pose a threat to life safety. In particular, ships, offshore platforms, offshore wind power and other equipment that sail and work in cold weather or polar environment have a more urgent need for surface anti-icing treatment.The research and application of superhydrophobic coatings in the field of anti-icing and de-icing has important scientific significance and application value for the development of more advanced anti-icing and de-icing technologies. However, superhydro-phobic coatings still face several unresolved problems in large-scale application and development, which limit their potential for widespread application. The combination of active de-icing and passive anti-icing strategies can significantly improve the anti-icing performance of materials. Based on this, various photothermal and electrothermal superhydrophobic coatings with excellent mechanical durability were designed and prepared. The mechanical durability, functional characteristics, and anti-icing performance in low-temperature environments of the coatings are systematically studied.In addition, under the synergistic effect of photothermal-electrothermal, the coating exhibits longer delayed icing performance and rapid deicing and defrosting capabilities. Therefore, the multifunctional integrated superhydrophobic coating can provide a new way for practical anti-icing/de-icing applications.

Keywords Superhydrophobicity; Electrothermal; Photothermal; Mechanical durability; anti-icing

Reference

[1] Yuan Yuan, Lei yanhua et al., A robust photothermal superhydrophobic anti/de-icing composite coating fabricated from BP/SiO_2 on a modified fluorocarbon coating base, Progess in organic coatings,196(2024) 108725.

[2] Lei yanhua et al., Mechanically robust superhydrophobic polyurethane coating for anti-icing application, Progess in organic