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Short Communication

Spraying Fabrication of Durable and Transparent Coatings for Anti-icing Application: Dynamic Water Repellency, Icing delay, and Ice adhesion

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INTRODUCTION

Anti-icing/icephobic coatings, typically applied in the form of surface functional materials, are considered to be an ideal selection to solve the icing issues faced by daily life and industrial production. However, the applications of anti-icing coatings are greatly limited by the two main challenges: bonding strength with substrates and stability of the high anti-icing performance. Here, we designed and fabricated a kind of high-performance superhydrophobic fluorinated silica (F-SiO2) @polydimethylsiloxane (PDMS) coatings, and further emphasized the improvement of the bonding strength with substrates and the maintenance of high anti-icing performance. The resultant coatings exhibited excellent water repellency with a contact angle up to 155.3° and a very short contact time (~10.2 ms) of impact droplets. At low temperatures, the coming droplets still rapidly rebounded off the coating surface, and the superhydrophobic coatings displayed a more than fiftyfold increase of freezing time comparing with bare aluminum. The ice adhesion strength on the coatings was only 26.3 kPa, which was far less than that (821.9 kPa) of bare aluminum. Furthermore, the nanoporous structures constructed by anodic oxidation could tremendously enhance the bonding strength of the coatings with substrate, which was evaluated through a standard method (ASTM D3359). The anti-icing properties still retained high stability under the conditions of 30 icing/deicing cycles, soaking and scouring of acid solution (pH=5.6). This work can effectively push the anti-icing coatings towards a real-world application.

Biography

Dr. Yizhou Shen has completed his PhD in Materials Science and Engineering by Nanjing University of Aeronautics and Astronautics, and postdoctoral studies from Nanyang Technological University, Singapore. He has worked as Assoc. professor of Materials Science and Engineering college at Nanjing University of Aeronautics and Astronautics. He has published more than 40 papers in Materials Science journals and applied for more than 10 invention patents.

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