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Xinghua Wu, Xin Zhao, Jeffrey Weng Chye Ho, Zhong Chen

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Design and Durability Study of Environmental-friendly Room-Temperature Processable Icephobic Coatings

*Xinghua Wu, Xin Zhao, Jeffrey Weng Chye Ho, Zhong Chen**

School of Materials Science and Engineering, Nanyang Technological University, 50 Nanyang Avenue, 639798, Singapore

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Abstract: Ice accumulation leads to improper functioning or even damages to ships, offshore platforms, sports facilities and land buildings in cold climate regions. Although fluorochemicals have demonstrated attractive performance for icephobic applications, their use has been restricted due to health and environmental concerns. Here, we present a facile method to fabricate fluorine-free icephobic coatings with potential applications for outdoor facilities and structures. The coating consists of a silicone-epoxy hybrid resin, polydimethylsiloxane (PDMS) and SiO₂ nanoparticles with different sizes. Particularly, the use of different sized (10-20 nm and 200 nm) SiO₂ nanoparticles results in excellent icephobicity and mechanical properties. The mechanical properties and durability of the coating were analysed according to respective test standards and compared with reported icephobic coatings. The durable icephobic potency of the coatings is very promising as a sustainable green solution for various practical anti-icing applications.

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