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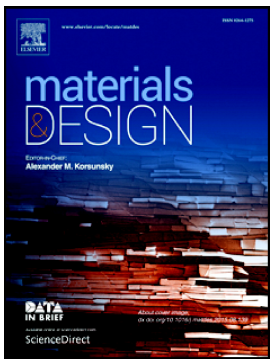

Fabrication of robust and scalable superhydrophobic surfaces and investigation of their anti-icing properties

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Fabrication of robust and scalable superhydrophobic surfaces and investigation of their anti-icing properties

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Abstract

Superhydrophobic surface (SHS) has attracted tremendous scientific interests in anti/de-icing due to its extremely low water affinity. However, poor durability and scalability have greatly hindered its applications; besides, study of the ice adhesion on SHS is not sufficient. Here, robust SHS with various surface structures and chemical components were obtained via a facile process: a suspension containing ultra-high molecular weight polyethylene (UHMWPE) and multi-scale silica nanoparticles (SNs) was poured on steel substrate and followed with desiccation. The surface could withstand severe abrasion without losing superhydrophobicity, and showed possibility to be scaled up. The ice adhesion tests showed that: 1) the surface structures played more important role in reducing ice adhesion than the surface chemical components; 2) the ice adhesion tended to be minimized on the SHS with multi-scale nanoparticles. The low ice adhesion could be ascribed to the following two aspects: the air pockets that greatly reduced the contact between ice and the resultant surface, and the lubrication of overcooled water in the surface asperities.