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Anti-icing performance of superhydrophobic aluminum alloy surface and its rebounding mechanism of droplet under super-cold conditions

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Abstract

This work presented a facile and environment friendly method to fabricate the biomimetic superhydrophobic surfaces with micro-nano hierarchical structure on aluminum alloy successfully. It has shown a high contact angle of 164 ° and low slide angle of 2 °. Both static and dynamic analyses have been carried out to testify its excellent anti-/deicing property by mimicking natural environment. A mechanical model is built to analysis the dynamic process of supercold water droplets with different pH values impacting on the cold superhydrophobic surface in detail. Furthermore, this process is also analyzed at the aspect of energy. The framework of the present work provides an insight for the design and analysis of superhydrophobic surfaces for ice prevention in harsh environment.

Key words: Anti-icing, Superhydrophobic, Aluminum alloy, Rebounding mechanism, Static and dynamic analysis

1. Introduction