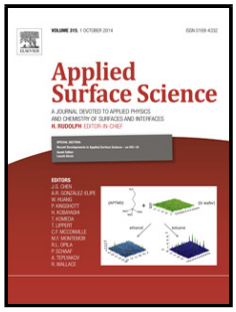

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Author: F.Y. Lv P. Zhang

PII: S0169-4332(14)02138-2
DOI: http://dx.doi.org/doi:10.1016/j.apsusc.2014.09.147
Reference: APSUSC 28803

To appear in: *APSUSC*

Received date: 6-7-2014
Revised date: 3-9-2014
Accepted date: 22-9-2014

Please cite this article as: F.Y. Lv, P. Zhang, Fabrication and Characterization of Superhydrophobic Surfaces on Aluminum Alloy Substrates, *Applied Surface Science* (2014), http://dx.doi.org/10.1016/j.apsusc.2014.09.147

Fabrication and Characterization of Superhydrophobic Surfaces on Aluminum Alloy Substrates

F. Y. Lv, P. Zhang*

Institute of Refrigeration and Cryogenics, Shanghai Jiao Tong University, Shanghai, 200240, China

ABSTRACT

Superhydrophobic surfaces have potential anti-icing applications in industries and daily life. In the present study, we combine the methods of chemical etching and surface modification with 1H, 1H, 2H, 2H-Perfluorooctyltriethoxysilane (POTS) which has very low surface energy to simplify the fabrication procedures for superhydrophobic surfaces on aluminum alloy substrates. The results show that the contact angle (CA), rolling angle (RA) and contact angle hysteresis (CAH) of superhydrophobic surfaces etched with 8.0 wt% HCl aqueous solutions are 162.5°, 1.9° and 1.1°, respectively; the apparent surface free energies (ASFEs) of superhydrophobic surfaces increase with the decrease of surface temperature; the freezing time of water droplets on the superhydrophobic surfaces is retarded by 1568 s, and the temperature drops to as low as -11.9 ℃. The results indicate that the superhydrophobic surfaces exhibit excellent anti-icing properties.

Keywords

Superhydrophobic surface; Ice nucleation; Freezing time delay; Anti-icing properties; Apparent surface free energy

1. Introduction

Superhydrophobic surfaces with high contact angles (CAs), low rolling angles (RAs) and contact angle hysteresis (CAH) have many potential applications in industries because they show the characteristics of low ice adhesion force to surfaces and self-cleaning. The fabrication of superhydrophobic surfaces generally includes two

* Corresponding author. Tel: +86-21-34205505; Fax: +86-21-34206814.
E-mail address: zhangp@sjtu.edu.cn (P. Zhang)