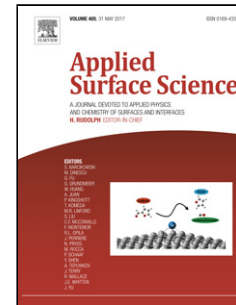


Accepted Manuscript

Title: Modeling the impact, spreading and freezing of a water droplet on horizontal and inclined superhydrophobic cooled surfaces

Author: Yina Yao Cong Li Hui Zhang Rui Yang



PII: S0169-4332(17)31102-9
DOI: <http://dx.doi.org/doi:10.1016/j.apsusc.2017.04.085>
Reference: APSUSC 35766

To appear in: *APSUSC*

Received date: 25-10-2016
Revised date: 11-3-2017
Accepted date: 9-4-2017

Please cite this article as: Y. Yao, C. Li, H. Zhang, R. Yang, Modeling the impact, spreading and freezing of a water droplet on horizontal and inclined superhydrophobic cooled surfaces, *Applied Surface Science* (2017), <http://dx.doi.org/10.1016/j.apsusc.2017.04.085>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Modeling the impact, spreading and freezing of a water droplet on horizontal and inclined superhydrophobic cooled surfaces

Yina Yao^a, Cong Li^a, Hui Zhang^a, Rui Yang^{a,*}

^aInstitute of Public Safety Research, Department of Engineering Physics, Tsinghua University, Beijing, 100084, China

Abstract

It is quite important to clearly understand the dynamic and freezing process of water droplets impacting a cold substrate for the prevention of ice accretion. In this study, a three-dimensional model including an extended phase change method was developed on OpenFOAM platform to simulate the impact, spreading and freezing of a water droplet on a cooled solid substrate. Both normal and oblique impact conditions were studied numerically. The evolution of the droplet shape and dynamic characteristics such as area ratio and spread factor were compared between numerical and experimental results. Good agreements were obtained. The effects of Weber number and Ohnesorge number on the oblique impact and freezing process were investigated. A regime map which depicts the different responses of droplets as a function of normal Weber number and Ohnesorge number was obtained. Moreover, the impact, spreading and freezing behavior of water droplets were analyzed in detail from the numerical results.

Keywords:

Numerical modeling; Impact; Freezing; Superhydrophobic cooled surface; Inclined; Water droplet;

*Corresponding author:

Rui Yang, Institute of Public Safety Research, Department of Engineering Physics, Tsinghua University, Beijing 100084, China.

Email: ryang@mail.tsinghua.edu.cn

Download English Version:

<https://daneshyari.com/en/article/5346871>

Download Persian Version:

<https://daneshyari.com/article/5346871>

[Daneshyari.com](https://daneshyari.com)