

Accepted Manuscript

Full Length Article

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PII: S0169-4332(18)30746-3
DOI: <https://doi.org/10.1016/j.apsusc.2018.03.075>
Reference: APSUSC 38823

To appear in: *Applied Surface Science*

Received Date: 1 February 2018
Revised Date: 6 March 2018
Accepted Date: 9 March 2018

Please cite this article as: N. Xi, Y. Liu, X. Zhang, N. Liu, H. Fu, Z. Hang, G. Yang, H. Chen, W. Gao, Steady Anti-icing Coatings on Weathering Steel Fabricated by HVOF Spraying, *Applied Surface Science* (2018), doi: <https://doi.org/10.1016/j.apsusc.2018.03.075>

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Steady Anti-icing Coatings on Weathering Steel Fabricated by HVOF Spraying

Naiyuan Xi^a, Yan Liu^{a*}, Xiangning Zhang^b, Nan Liu^b, Hao Fu^a, Zongqiu Hang^a, Guiying Yang^a, Hui Chen^a, Wei Gao^c

^aSchool of Materials Science and Engineering, Southwest Jiaotong University

Chengdu, Sichuan, 610031, P.R. China

xiny_swjtu@163.com

^bCRCC TANGSHANG CO., LTD., Tangshan, Hebei, 064000, P.R.China

^cThe University of Auckland, Auckland 1142, New Zealand

ABSTRACT: Super-hydrophobic surface has attracted much attention over the years due to their unique wettability and excellent performances like highly hydrophobic, ice-phobic, etc. A fast and straightforward fabrication method in this work was proposed to prepare super-hydrophobic coating on weathering steel substrate by high velocity oxygen-fuel (HVOF) spraying, which aimed to delay the beginning freezing time, decrease the ice accumulation amount and reduce the adhesion of ice. The resulting showed that the contact angle of the coatings was about $154.3 \pm 3.0^\circ$, and the sliding angle was about $4.1 \pm 0.1^\circ$. Moreover, compared with steel substrate, as-prepared super-hydrophobic coatings exhibit memorable promotion in reducing icing weight and repelling ice.

KEY WORDS: HVOF, WC-Co, super-hydrophobic, anti-icing

1 INTRODUCTION

Ice accumulation on critical area of equipment may cause serious problems, take the brake disc of high speed rail as an example, clamp action will be affected by ice, meanwhile mixed ice slag will abrade the brake disc abnormally, which may reduce the service life. Also, icing will make transmission line overload, which may cause security risks [1-2]. ~~Therefore, materials that show anti-icing and de-icing properties have aroused much attention in recent years.~~

As we all know, lotus leaves repel water droplets due to their intrinsic hierarchical micro/nanostructure, which reducing actual contact area between water and solid surface [3]. Also, the micro/nanostructure of super-hydrophobic surface like lotus structure provides a vapor pockets at the solid-liquid interface [4] to reduce the loss of heat quantity [5], which may delay the freezing time. Therefore, numerous researchers focused on super-hydrophobic surface, which show excellent anti-icing and de-icing properties. Shen Y et al.

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