

Accepted Manuscript

A Novel Thermo-mechanical Anti-icing/De-icing System Using Bi-stable Laminate Composite Structures with Superhydrophobic Surface

Zheng Zhang, BingBin Chen, Congda Lu, Helong Wu, Huaping Wu, Shaofei Jiang, Guozhong Chai

PII: S0263-8223(17)31864-0

DOI: <http://dx.doi.org/10.1016/j.compstruct.2017.08.068>

Reference: COST 8826

To appear in: *Composite Structures*

Received Date: 14 June 2017

Revised Date: 10 August 2017

Accepted Date: 16 August 2017



Please cite this article as: Zhang, Z., Chen, B., Lu, C., Wu, H., Wu, H., Jiang, S., Chai, G., A Novel Thermo-mechanical Anti-icing/De-icing System Using Bi-stable Laminate Composite Structures with Superhydrophobic Surface, *Composite Structures* (2017), doi: <http://dx.doi.org/10.1016/j.compstruct.2017.08.068>

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.

A Novel Thermo-mechanical Anti-icing/De-icing System Using
Bi-stable Laminate Composite Structures with Superhydrophobic Surface

Zheng Zhang^{a*}, BingBin Chen^a, Congda Lu^{a*}, Helong Wu^b, Huaping Wu^a,
Shaofei Jiang^a, Guozhong Chai^a

^aKey Laboratory of E&M (Zhejiang University of Technology), Ministry of Education & Zhejiang Province, Hangzhou 310014, P.R. China

^bSchool of Civil Engineering, The University of Queensland, St Lucia, QLD 4072, Australia

*Corresponding author. E-mail address: z Zhangme@zjut.edu.cn (Zheng Zhang), lcd@zjut.edu.cn (Congda Lu). Telephone: 86-571-88320244.

Abstract : A novel anti-icing/de-icing system composed of bi-stable laminate composite structures with superhydrophobic surface and soft electrothermal patch is investigated in this paper. In this system, the superhydrophobic surface has superior performance in anti-icing and de-icing by reducing the adhesion of the ice-skin interface; meanwhile, a thermo-mechanical way to remove ice is conducted by deforming the bi-stable structures using heating actuation method. The superhydrophobic layer is fabricated by decreasing the free energy of copper oxide on the copper surface. The water contact angle of the superhydrophobic surface is tested by an optical contact angle measuring device, which reaches above 155° and the sliding angle is less than 10°. In addition, the microstructure of superhydrophobic layer is characterized by using a scanning electron microscope (SEM) to illustrate the superhydrophobic mechanism. Moreover, outstanding self-cleaning properties and UV-durability are obtained on the prepared surface. Experimental results indicate that the system has good performances in both anti-icing and de-icing processes when working at the subzero temperature. Meanwhile, there is no liquid water left on the surface after the snap-through process of bi-stable structures. Besides, the factors that affect the anti-icing and de-icing performance of system are discussed, including the superhydrophobic property, morphing characteristic of bi-stable laminate composite

Download English Version:

<https://daneshyari.com/en/article/4917695>

Download Persian Version:

<https://daneshyari.com/article/4917695>

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