

MAR 30, 2017

Energy Transport Phenomena Governed by Interfaces

ABSTRACT:

A fundamental understanding of solid-liquid interfaces play a critical role in energy, water and even biological systems (e.g. freezing, condensation, evaporation, crystal growth and regenerative medicine). Knowledge on physics of these interfaces allows us to control interfacial momentum and energy transfer in multiple length and time scales and to create new surfaces with unprecedented characteristics. In the first part, we introduce new self-healing magnetic surfaces. Physic of these surfaces are discussed and their implementation as anti-icing surfaces are shown. These magnetic surfaces outperform other state-of-the-art anti-icing surfaces with ice formation temperature of -34 oC and ice adhesion strength of ~ 2 Pa (five orders of magnitude lower than state-of-the-art surfaces). Next, the implementation of these surfaces in droplet microfluidics will be discussed. In the second part, we introduce new decoupled hierarchical structures to tune heat transfer at solid-liquid interfaces. These structures allow us to independently manipulate the involved forces and achieve high heat dissipation capacity and eliminate the Leidenfrost limit. This limit is the bottleneck for cooling of electronics, photonics, and high-capacity energy systems. Finally, future research directions in this field will be discussed.

BIOGRAPHY:

Hadi Ghasemi is Bill D. Cook Assistant Professor in the Department of Mechanical Engineering at the University of Houston and director of Nanotherm research group. He received his PhD degree in 2011 from the University of Toronto and continued his studies as a Postdoctoral Associate at Massachusetts Institute of Technology (MIT) from 2012 to 2014. He is recipient of several prestigious awards in the field of heat transfer and thermodynamics including AFOSR Young Investigator Award, Teaching Excellence Award, NSERC Fellowship and Russel Reynolds award in Thermodynamics. Furthermore, he is the track organizer of Micro-Nano Poster Forum in IMCECE conferences and has served as a track organizer of several international ASME conferences. In 2014, he was selected as one of the finalist for World Technology Award in the energy category. He has published more than 25 journal articles and have 5 granted patents and his works are highlighted in Nature, Economics and other news agencies. His current research interests are in nanotechnology, heat transfer and surface physics.



HADI GHASEMI

*Assistant Professor
Department of Mechanical
Engineering
University of Houston
Houston, TX*