

Mechanical and Aerospace Engineering

seminar

From Jumping Drops to Thermal Diodes

April 20, 2012 at 2:00pm in SCOB 252

Abstract

On superhydrophobic surfaces, condensate drops spontaneously jump upon coalescence, giving rise to self-sustained dropwise condensation without any external driving forces. The self-propelled motion results from the surface energy released upon drop coalescence, while the out-of-plane jumping results from the superhydrophobic substrate breaking the symmetry of energy release. In this talk, we will first illustrate the physical mechanism of the self-propelled jumping, including the capillary-inertial velocity scaling and the conditions conducive to the spontaneous motion. We will then discuss two applications of the jumping drops: a new self-cleaning mechanism for water-repellent surfaces that works without rain, and a planar phase-change thermal diode that is inherently scalable to large areas.

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Biosketch

Chuan-Hua Chen is the Hunt Faculty Scholar and Assistant Professor of Mechanical Engineering and Materials Science at Duke University since 2007. Dr. Chen received his B.S. degree in Applied Mechanics from Peking University (1998) and Ph.D. degree in Mechanical Engineering from Stanford University (2004). Dr. Chen is a recipient of numerous awards including the NSF CAREER Award and the DARPA Young Faculty Award. His research has been widely covered by both professional magazines and popular media, including Science Magazine and the Discovery Channel.

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