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Innovation Infosheet

Reversibility of the Cassie-Wenzel Transition on Superhydrophobic Surfaces

Track Code: 65596

Categories:
- Micro & Nanotechnologies

Keywords:
- Heat Transfer
- Mechanical Engineering
- Micro & Nanotechnologies
- Microfluidics

Superhydrophobicity has attracted significant research attention in the past decade because of potential applications in the fields of lab-on-chip devices, energy systems, and heat transfer. Currently, liquids can be precisely positioned on a microscale; however, once a droplet has undergone a chemical reaction, it becomes significantly harder to transport. Existing techniques for post reaction transport involve oil environments, mechanical vibration, or the application of heat. All of these techniques present significant drawbacks, which have limited their adoption and the adoption of superhydrophobic surfaces in general.

Researchers at Purdue University have developed a novel method for determining the amount of energy needed to either force a liquid droplet into a textured surface or pull a liquid droplet from a textured surface. This lends itself to achieving complete control over the motion of a liquid droplet on superhydrophobic surfaces with dielectrophoresis. By accurately determining the energy required for wetting reversibility, the movement of a liquid droplet can be precisely controlled. Inducing wetting reversibility is repeatable and there is no loss of liquid with repeated droplet reactions and movement. In addition, this technology can be applied across a wide range of uniform and non-uniform surface textures and surface feature sizes to enhance surface heat transfer.

Advantages:
-Increases the practical uses for superhydrophobic surfaces
-Increased reliability, repeatability, and ease of integrability within microfluidic frameworks

Potential Applications:
-Biomedical engineering
-Pharmaceuticals
-Microfluidics
-Electrowetting systems

-Microelectronics thermal management
-MEMS
-Lab-on-a-chip systems

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Intellectual Property:

Application Date: April 13, 2011
Type: Utility Patent
Country of Filing: United States
Patent Number: 8,632,670
Issue Date: January 21, 2014

Application Date: January 16, 2014
Type: CON-Patent
Country of Filing: United States
Patent Number: (None)
Issue Date: (None)

Application Date: April 13, 2010
Type: Provisional-Patent
Country of Filing: United States
Patent Number: (None)
Issue Date: (None)

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