筑波大学
University of Tsukuba

EME International Seminar Series

Hot water repellencies

Dr. Timothée Mouterde

Lecturer, Department of Mechanical Engineering
The University of Tokyo, Japan

Abstract:

Covering a solid with hydrophobic micrometric or nanometric-scale roughness gives rise to a strong water-repellent property known as superhydrophobicity. On such surfaces, water contacts only the tops of the roughness, forming an air layer between the liquid and the surface. This confers vanishing adhesion and exceptional mobility of drops on solids, two properties which are useful for preventing undesired liquid accumulation and for manipulating small liquid volumes in chemical or biological applications. While such surfaces can efficiently repel water, it is less known that they often fail to repel hot liquids. When a hot drop contacts a colder substrate, the water vapor contained in the surrounding humid air can recondense within the surface roughness, destroying the air layer responsible for liquid repellency. In this presentation, we will study how the adhesion of drops in non-wetting states is affected by their temperature. We will first explore the adhesion of hot water drops on superhydrophobic surfaces with model surface nanostructures and discuss how the structures' size and shape can be engineered to give rise to hot liquid repellency. Then we will consider the case of hot drops impacting colder superhydrophobic substrates. For this dynamic situation, we will show that a second route can achieve hot liquid repellency. Finally, we will discuss how other non-wetting states are affected by temperature differences.

Thursday, May 29, 2025 16:00 – 17:00 p.m. JST
@3E301 (On-site only)

Degree Program in Engineering Mechanics and Energy, University of Tsukuba
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Bio:

Timothée Mouterde graduated from École polytechnique (France) and received his PhD from Université Paris-Saclay in 2017. During his PhD, supervised by David Quéré, he worked on antifogging surfaces and the dynamics of Leidenfrost and superhydrophobic drops. He then joined the group of Lydéric Bocquet at École Normale Supérieure Paris (ENS) to study experimentally fluid transport inside angstrom-scale channels, in collaboration with Radha Boya and Ashok Keerthi. By 2019, he moved to the University of Tokyo, joining Takuro Ideguchi's laboratory, where, with the support of JSPS and MSCA postdoctoral fellowships, he focused on developing new optical techniques for nanofluidics. In 2021, he was selected for the University of Tokyo's Excellent Young Researcher program and started his research group within the Department of Mechanical Engineering. His research focuses on fluid/solid interactions, from wetting phenomena to nanofluidics.

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