

Title **A roadmap to design optimum surfaces for phase change heat transfer**

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Date & Time Friday, September 30, 2016 4:00 p.m.

Place I²CNER Hall, Ito campus, Kyushu University

Abstract

Phase change heat transfer is a complex transport process involving dynamic deformations of multiple interfaces between solids, liquids and vapors. Here, a roadmap to enhance phase change heat transfer is formulated on the general hypothesis that an optimal surface for phase change heat transfer should match the features of phase change heat transfer in the same way as a key matches a lock. Indeed, boiling and condensation have better efficiency and performance when both the liquid and vapor phases are in contact with the solid surface transferring heat. This situation is promoted by surfaces with spatial biphilicity, which juxtapose hydrophilic and hydrophobic regions. These surfaces have demonstrated significant enhancements of critical heat flux and efficiency in phase change heat transfer. We then investigate temporal biphilicity, with functional surfaces that vary their wettability between hydrophilic and hydrophobic upon sequential application of stimuli. These surfaces will have enhanced hydrophobicity at low heat fluxes, to promote nucleation, and enhanced hydrophilicity at high heat flux, to promote wicking and prevent critical heat flux.

About the Speaker

Prof. Daniel Attinger's research area is in fluid dynamics and heat transfer at small scales, with applications in forensics, bioengineering, energy technologies. After a 2001 PhD at ETH Zurich and faculty positions at Stony Brook and Columbia University, Attinger is since 2011 Associate Professor with Iowa State University. He has produced about 80 journal and conference papers. He has been visiting Professor at the Swiss Polytechnic Federal Institute and at Tsinghua University, Beijing. He has given more than 60 invited talks and keynotes in the Americas, Asia and Europe. Attinger is the co-inventor of four US and international patents. He is the recipient of the ETH Zurich medal for outstanding Ph.D. thesis (2001), an NSF CAREER award for young investigators (2005), the 2012 ASME ICNMM Outstanding Researcher Award. He led one of the 7 teams of the 2013 Presidential Interdisciplinary Research Initiative at Iowa State University, and received the Award of Professor of the Year 2014 by the senior class of Mechanical Engineering. He is a Fellow of the American Society of Mechanical Engineers.

Host: Prof. Yasuyuki Takata

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