

Title Local heat transfer near moving 3-phase contact lines and its influence on nucleate boiling and drop evaporation

Speaker Prof. Peter Stephan
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Place I²CNER Hall, Ito campus, Kyushu University

Abstract

When a vapor bubble is growing and detaching from a nucleus at a superheated wall the liquid-vapor-solid contact line moves along the wall with high velocities. A similar situation can be observed when a liquid droplet impinges on a superheated wall and consequently spreads and evaporates. In both situations the microscopic heat and mass transfer phenomena in the contact line region have a strong influence on the macroscopic heat transfer rate. To quantify the contact line influence and to understand the multiscale heat transfer phenomena generic experimental setups were built for both situations applying integrating modern measurement devices such as IR thermography, video recording, micro-thermocouples etc. with high spatial and temporal resolution. Additionally the experimental configurations were reproduced by detailed numerical simulations based on multiscale thermo-fluiddynamic models. The experimental and numerical approaches and joint results will be presented. The transient heat transfer paths from heat source to heat sink will be discussed in detail.

About the Speaker

Prof. Peter Stephan studied Mechanical Engineering at the Technical University Munich from 1983 to 1988. Subsequently he received a Marie-Curie-Fellowship from the European Commission and moved to the EC Joint Research Centre Ispra in Italy where he joined the 2-phase heat transfer research group. In 1992 Peter Stephan received a PhD from the University of Stuttgart for his work on heat pipe modeling. From 1992 to 1997 he was working as a senior process engineer and R&D manager in the Daimler-Benz group. Since 1997 Peter Stephan is a Full at the Technical University Darmstadt. He is head of the Institute for Technical Thermodynamics. His main fields of research are boiling heat transfer, micro-scale heat and mass transfer, interfacial phenomena, heat pipes, heat transfer enhancement, and drying processes. From 2007 to 2009 Peter Stephan served as the dean of the mechanical engineering faculty. He is co-director of the Center of Smart Interfaces and spokesperson of the Cluster Thermo-fluidics and Combustion Engineering, a huge alliance for interdisciplinary research at TU Darmstadt. Since 2011 he is Senator of TU Darmstadt. Peter Stephan is the acting president of the German Heat and Mass Transfer Society, editor-in-chief of the VDI Heat Atlas, and member of several international editorial boards and associations. He received several international awards in the field of heat transfer, recently in 2012 the Nukiyama Memorial Award of the Heat Transfer Society of Japan.

Host: Professor Yasuyuki TAKATA

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