PREFACE: TWO-PHASE SYSTEMS

Two-phase systems continue to be an important part of the scope of the *Interfacial Phenomena and Heat Transfer* journal. Examples of such systems are boilers, condensers, jets, sprays, micro heat pipes, and shear-driven liquid films and rivulets. Some of the applications of two-phase flow include cooling of electronic devices, flotation, enhanced oil recovery, air-conditioning and refrigeration systems, and many others.

This issue comprises a collection of several contributions from the two-phase flow community. Accepted papers represent research groups from several countries and use both sophisticated experimental techniques and advanced theoretical/numerical approaches to investigate two-phase systems. The following provides a brief overview of some key results that are included in this issue.

Accurate velocity measurements in different regions of two-phase flows are important for a number of applications. Two papers provide the experimental investigations of flow velocities for different flow configurations. ***Sun et al.*** investigates the droplet velocity distributions for a water spray in air cross-flow in a rectangular duct. Mixing of droplets is studied under different flow conditions, with particular emphasis on the role of a counter-rotating vortex pair formed as a result of the interaction of spray and cross-flow. ***Bobylev et al.*** utilizes a micro-PIV system to investigate velocity fields in deforming rivulets that are formed as an aqueous glycerol solution flows down a vertical plate. Simultaneous measurements of the liquid-gas interface shapes are carried out using the laser-induced fluorescence technique. To obtain regular wave shapes, the inlet flow rate is modulated at a prescribed frequency. A stagnation region of the flow is found under the wave crests at low modulation frequencies.

Two papers investigate the rupture of thin liquid films, a crucial problem for applications in microscale heat transfer and microfluidics. ***Ovcharova*** and ***Stankous*** conduct a numerical investigation of a thin liquid film on a flat solid substrate. Localized heating of the liquid surface leads to its deformation and eventual film rupture due to the effect of thermocapillary stresses. Convective motion in the liquid is generated and characterized by formation of two vortices. Depending on the intensity of heating, the vortices can persist up to the point of final rupture or disappear at an earlier time. ***Ketelaar*** examines a thin liquid film on surface structured by a periodic array of gas-filled grooves. The instability and rupture of the film is driven by electrostatic interactions due to electric charges present at both liquid-gas and liquid-solid interfaces. Analytical stability criteria are found using the Floquet theory, followed by the numerical simulation of the evolution equation for film thickness. The total rupture time is shown to decrease as a result of surface structuring.

Fang and ***Amirfazli*** discuss wetting on different types of structured surfaces. This paper includes a detailed overview of previous studies in the field and a report on experimental data for wetting on surfaces with microgeometries defined by periodic arrays of pillars of square, triangular, and circular cross-sections. The surfaces are manufactured by lithography and reactive ion etching of silicon substrates. Both advancing and receding contact angles are investigated as functions of the properties of surface structuring. Physical effects such as contact line pinning on the edges and corners of the microstructure and anisotropic nature of spreading are discussed.

The paper by ***Leal et al.*** is a combination of experimental and mathematical modeling of the onset of nucleate boiling in a narrow space with one of the walls which is dynamically deformed. Deformation is shown to result in a significant decrease of the wall superheat at the onset of boiling.

The Guest Editors are grateful to all contributors and hope that this special issue will be a useful resource for the community of researchers studying *Two-Phase Systems*.

Guest Editors:

Vladimir Ajaev
Southern Methodist University,
Dallas, Texas

Hitoshi Asano
Kobe University
Kobe Japan

Olga N. Goncharova
Altai State University
Barnaul, Russia

Marc Miscevic
Toulouse University,
Toulouse, France

2169–2785/14/$35.00