

Preface: Thermal-fluid dynamics of multiphase flow

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PREFACE: THERMAL-FLUID DYNAMICS OF MULTIPHASE FLOW

Thermal-fluid dynamics of multiphase flow are the key theoretical fundamentals to the innovation and development in many academic subjects and industrial technologies, such as thermal energy and power engineering, geothermal energy utilization, thermohydraulics in nuclear reactors, oil-gas recovery, transport and measurement, fuel injection in propulsion engines, microscale and nanoscale multiphase flow chemical and biological processes. Advanced technologies in this domain are significant and vigorous financial supports to the research and technology development have been continuously offered by various funding agencies and industrial enterprises. In these technologies, thermal-fluid dynamics in multiphase flow plays a key role. However, the processes are very complex and involve various mutual coupling phenomena of heat and mass transfer, phase transition, interfacial instability and deformation, thermal-physical properties variation, and compressible flows. As such, multiphase flow and thermal processes exhibit high nonlinearity and multiscale characteristics. Understanding the underlying mechanisms of the multiphase flow thermal-fluid dynamics is very important in the development and optimization of many key technologies but still a big challenge. Great efforts have been made to develop theoretical knowledge, mechanisms, and models of multiphase flow and heat transfer in past decades. However, there are still many challenges to fully clarify these complex dynamics; For example, the high-resolution, fast, and simultaneous multiphase parameter measurements in the experiments, and the precise, efficient turbulent simulations in engineering scale are far from being developed, especially at high speed, high temperature, and high pressure conditions. With the great needs of technology development and emerging subjects, multiphase flow and thermal processes have continuously attracted great zest and motivation from a large number of scientists and engineers to explore new theories, mechanisms, experimental techniques, and advanced models.

This Special Issue, titled “Thermal-Fluid Dynamics of Multiphase Flow,” is aimed at reflecting the advance of recent research in this important area. In this Special Issue, eight articles are included, which cover various topics in experimental and numerical studies: (1) cavitating flows past circular cylinder, blockage effects; (2) droplet ejection and impacts on hydrophobic surface; (3) heat transfer, scaling behavior, geothermal fluids; (4) two-phase flows and critical heat flux; (5) interfacial phenomena, free liquid surface sloshing and suppression; (6) rheology of methanol-based metal oxide nanofluids; (7) cavitation, cone flowmeter, gas–liquid two-phase flow; (8) liquid film, nonlinear waves.

All the papers published in this Special Issue have undergone rigorous peer-review process according to the requirements of *Interfacial Phenomena and Heat Transfer* (IPHT). We would like to express our great thanks to all authors and reviewers for their contributions to this special issue. It is our great wish that this issue can provide state-of-the-art research in thermal-fluid dynamics in multiphase flow, inspiration, and reference for future work in this field.

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