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Editorial

Two-Phase Flow and Heat Transfer Enhancement

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Gas-liquid two-phase flow and heat transfer processes are commonly encountered in a wide variety of applications, for example, refrigeration and air-conditioning systems, power engineering, and other thermal processing plants. The advantage of high thermal performance in comparison to the single-phase applications leads to various engineering applications including the cooling systems of various types of equipment such as high performance microelectronics, supercomputers, high-powered lasers, medical devices, high heat-flux compact heat exchangers in spacecraft and satellites, and so forth. The aim of this special issue was to collect the original research and review papers on the recent developments in the field of two-phase flow and heat transfer enhancement. Potential topics included advanced heat pipe technologies, boiling and condensation heat transfer, CHF and post-CHF heat transfer, cooling of electronic system, Heat and mass transfer in phase change processes, instabilities of two-phase flow, measurements and modeling of two-phase flow in microchannel, microgravity in two-phase flow, nanofluids science and technology, nuclear reactor applications, passive and active heat transfer enhancement techniques, Refrigeration and air-conditioning technology, two-phase flow with heat and mass transfer, two-phase refrigerant flow, and special topics on the latest advances in two-phase flow and heat transfer. In this special issue, we have invited a few papers that address such issues.

First paper of special issue investigates the effect of convergence angle of microchannel on two-phase flow and heat transfer during steam condensation experimentally. The experimental results show that the condensation heat flux increases with an increase in the convergence angle and/or the steam mass flux at a given coolant flow rate but decreases with an increase in the coolant flow rate at a given steam mass flux. Second paper focuses on simulating mist impingement cooling under typical gas turbine operating conditions of high temperature and pressure in a double chamber model. The results of this paper can provide guidance for corresponding experiments and serve as the qualification reference for future more complicated studies with convex surface cooling. In third paper, economic analysis of rebuilding an aged pulverized coal-fired boiler with a new pulverized coal-fired boiler including flue gas desulfurization unit and a circulating fluidized bed boiler is investigated in existing old thermal power plants. The fourth paper presents the results of a CFD analysis and experimental tests of two identical miniature flat plate heat pipes using sintered and screen mesh wicks and a comparative analysis and measurement of two solid copper base plates 1 mm and 3 mm thick. In fifth paper, a modeled room was numerically heated from a wall and cooled from the opposite wall in order to create a real-room simulation. The cooled wall simulated heat loss of the room, and the heated wall simulated the heat source of enclosure. The effects of heated and cooled wall temperatures on convective heat transfer coefficient and Nusselt number in the enclosure were investigated numerically for two- and three-dimensional (3D) modeling states.

In summary, this special issue reflects a variety of contemporary research in heat transfer and is expected to promote further research activities and development opportunities.

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