Journal of Applied Mathematics

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Special Issue on

Novel Analytical and Numerical Methods in Heat Transfer Enhancement and Thermal Management

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Energy and materials saving considerations, as well as economic incentives, have led to efforts to produce more efficient heat exchange equipment. Different applications have different needs, usually requiring custom-designed solutions, but those solutions need to be reliable and sustainable.

Heat transfer enhancement (HTE) and thermal management (THEMA) are very attractive issues in the research and industry fields. They play an important role in improving energy efficiency and developing high performance thermal systems. Several heat transfer enhancement techniques have been used in many engineering applications such as nuclear reactor, chemical reactor, chemical process, automotive cooling, refrigeration, and heat exchanger. HTE and THEMA techniques are powerful tools to increase and improve heat transfer rate and thermal performance and to reduce the size of heat transfer system in installing and operating costs. Augmentation techniques can be classified either as passive methods, which require no direct application of external power, or as active methods, which require external power.

The effectiveness of both types of techniques is strongly dependent on the mode of heat transfer, which may range from single-phase free convection to dispersed-flow film boiling. Examples of passive methods are turbulence promoter (such as special surface geometries, twisted tape, propeller, tangential inlet nozzle, snail entry, axial/radial guide vane, and spiral fin) or fluid additives (such as nanofluid), without using any direct external power source. Due to its easy installation/operation and cost saving, passive method has drawn great attention. The augmentation technique is complex if two or more passive and/or active methods are present simultaneously.

The aim of this special issue is to collect original research articles on the most recent analytical and numerical models applied in this field, with the purpose of providing guidelines for future research directions.

Potential topics include, but are not limited to:

- Transient heat transfer
- System design and optimization in natural, mixed, and forced convection
- Numerical and analytical investigations on heat transfer in porous media and systems for active enhancement of heat transfer
- Mathematical and numerical modeling of single-phase and multiphase convection with nanofluids
- Applied, computational, and industrial mathematics in applications including heat exchangers, cooling of electronics, power generation, solar systems, and microfuel cells
- Numerical and analytical investigations on heat transfer in microchannels, minichannels, and microdevices cooling
- Heat transfer enhancement in separated flows, encountered in various engineering applications, such as combustors, axial and centrifugal compressor blades, gas turbines blades, and microelectronic circuit boards

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