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Editorial

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

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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. HTE and THEMA techniques are powerful tools to increase and improve heat transfer rate and thermal performance as well as to reduce the size of heat transfer systems in installation and operational costs.

The basic purpose 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 direction.

This special issue showed novel and interesting analytical and numerical procedures applied in heat transfer enhancement and thermal management.

The topics of the accepted papers cover a wide area of the heat transfer field, from the transient heat transfer to the heat transfer in porous media and to the system design and optimization in forced convection.

A brief overview of each manuscript selected for this special issue is presented in the following, in alphabetical order of the first author.

C. Devaraj et al. investigate numerically natural convection heat transfer in a two-dimensional square enclosure at various angles of inclination using a finite volume based computational procedure. The heat transfer is from a constant temperature heat source of finite length centered at one of the walls to the cold wall on the opposite side while the remaining walls are insulated. The authors analyze the effect of area ratio of the heat source, Rayleigh number, and angle of inclination of the enclosure on the flow field and the heat transfer characteristics. Moreover the paper shows an exhaustive verification and validation section and gives heat transfer correlation equations for each angle of inclination of enclosure investigated which are in good agreement with the numerical results.

I. Simões et al. present, in their paper, a set of fully analytical solutions, together with explicit expressions, in the time and frequency domain for the heat conduction response of homogeneous unbounded and of bounded rectangular spaces (three-, two-, and one-dimensional spaces) subjected to point, line, and plane heat diffusion sources. The authors pay particular attention to the case of spatially sinusoidal, harmonic line sources. This last solution, referred to in the literature as the 2.5D problem. Proposed Green's functions are combined using an image source technique to model a half space, a corner, a layer system, a laterally confined layer system, a solid rectangular column, a solid rectangular column with an end cross section, and a 3D parallelepiped inclusion. This is the first such derivation that is expected