From the Guest Editors

CONTEMPORARY MODELLING METHODS IN HEAT, MASS, AND FLUID FLOW – Second Part

Special Collection of Articles

Modelling transport processes in heat, mass and fluid flow are always at the focus of the science in the modern era of rapid technological development. This is the second part of the collection of articles. The first part consisting of 14 articles was already published in No. 1A, 2017 and immediately attracted the attention of the scientific society. Now, we will try to present briefly the main results of the articles forming the second part.

Fractional calculus is a hot topic in modern modelling studies *via* accounts of relaxation problems adequately modelled by fractional operators. Alkahtani and Atangana (in this issue, p. 767) present an exact solution of these problems using the Green function method with some integral transform operators. The singular kernel used in this paper is based upon the power law function, which is used to construct the well-known Riemann-Liouville derivative with fractional order.

Wu *et al*. (in this issue, p. 813) focus the attention on a fractional non-linear diffusion equation of two orders as a model of strongly non-linear porous media flow. An equivalent integral equation is established and Adomian polynomials are adopted to linearize nonlinear terms. With the Taylor expansion of fractional order, recurrence formulae are proposed and novel numerical solutions are obtained to depict the diffusion behaviors more accurately.

Avci *et al*. (in this issue, p. 819) analyze a heat equation defined in terms of a local and limit-based conformable derivative providing some basic properties of integer order derivative. The fundamental solution in the case of a radial symmetric plate is the principle issue of the study and the results reveal successful outcomes in modelling sub-phenomena of heat diffusion. The solution is compared to the well-known solution in terms of Grunwald-Letnikov derivative, but additional direct analytical method developed in the study demonstrates that the numerical calculations could be avoided.

Classical modeling approach with integer-order derivatives to problems of heat, mass transfer are adequately and balanced presented in this part of the collection. Next, we will present briefly, three elegant studies in this area with practically relevant results.

Walther *et al*. (in this issue, p. 775) present an analysis and numerical simulations of possible heat recovery of self-heating compost piles for building applications. The energy released during the aerobic composting of lignin and cellulose-based materials is computed by solving an inverse problem based on an experimental phase taking data about the thermal history of the compost heap and a numerical procedure. The reached temperatures and recovered energy fit with the order of magnitude of building needs.

Mnsari *et al*. (in this issue, p. 785) present an excellent numerical analysis predicting the hygrothermal behavior of massive wood panel considered as biobased building material.

The developed macroscopic model coupling non- linear transfer of heat transfer air and moisture presents an adequate picture of the processes of engineering relevance meeting recognized standards of material characterizations. A series of hygrothermal calculation carried out in 2-D geometry allows the scale effect to be estimated. The model addresses boundary conditions relevant to the process of drying and to the real building situation.

Monier-Vinard *et al.* (in this issue, p. 797), present an elegant work on analytical solutions resolving steady-state thermal problems in a multi-layered structure heated by one or many heat sources. The problems relevant to sources of non-rectangular shapes allow extending the applications of analytical methods of solutions. In this context, the situation when various heating sources located on the external surfaces of the sandwiched N-layers is the principle issue of this study. The developed analytical solution is compared to numerical simulations and this comparison reveals a highly adequate agreement in prediction of the centroid and average temperatures. It is noteworthy that the developed analytical approach establishes a set of practical expressions which can be straightforwardly implemented in ordinary design procedures in solids-ate electronics as well as to process of early detect component or board temperatures beyond manufacturer limit.

We hope that the articles collected in the second part of the special collection *Contemporary Modelling Methods in Heat, Mass, and Fluid Flow* provides the readers new ideas and may be a good source for further inspirations in the thermal science problems.

Last but not least, we like to express our gratitude to all authors who trusted and contributed the collection, the reviewers offering their time to increase the quality of the contents, and the editors of *Thermal Science,* as well, for the support of our initiative.

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