Preface

The purpose of this Volume, entitled "New Research Developments in Heat and Mass Transfer Processes", is to provide a collection of recent contributions in the field of heat and mass transfer in porous media. It includes a set of new research developments in the field of basic and applied research work on the physical and chemical aspects of heat and mass transfer phenomena in a porous medium domain. This volume contents include both theoretical, experimental and numerical developments, providing a self-contained major reference that is appealing to both the scientists and the engineers.

The topics that will be presented in this Volume will be going to the encounter of a variety of scientific and engineering disciplines, such as chemical, civil, agricultural, mechanical engineering, etc. The book is divided 11 chapters that intend to be a resume of the current state of knowledge for benefit of professional colleagues, scientists, students, practitioners, lecturers and other interested parties to network.

In Chapter 1, Morais Pessôa et al. present a numerical analysis, using Galerkin based integral method, of cooling of fruits, with arbitrary shape, namely banana, orange, strawberry and Tahiti lemon. It has been found that the strawberry has lower dimensionless cooling time compared with time required to cool other fruits, which is due to its higher surface area/volume ratio value. In orange and lemon the temperature distribution was found to be homogeneous in the angular direction, while in banana and strawberry it was two-dimensional due to shape of the fruits. In Chapter 2, Silva et al. present a theoretically study of water absorption in unsaturated polyester composites reinforced with *caroá* fiber at different temperatures by using a transient 3D mathematical model via ANSYS CFX® Software. They show that the water absorption rate is faster in the vertex region of the composites, and mainly at higher temperature. In Chapter 3, Tkacz-Śmiech et al. present a new approach to model formation of expanded austenite (S-phase) during nitriding in plasma conditions. Diffusion saturation of the substrate (iron or austenite steel) is treated as interdiffusion of nitrogen and iron that involves stresses and plastic deformation and is based on the Darken scheme. Concentration profiles confirm existence of characteristic plateau like zone in the surface adjacent zone. This is followed by Chapter 4 by Araújo Mota et al. who present a numerical analyse of heat transfer in an epoxy resin polymer matrix incorporating Ni-Ti alloy wire with shape memory effect using ANSYS CFX software. In Chapter 5, Malico and Ferreira de Sousa present a numerical simulation approach to determine the importance of the inlet and outlet pressure drop effects on the total pressure drop in a staggered arrangement of square cylinders with equal sizes. In Chapter 6, Vasconcellos Araújo et al. present a transient thermal study of the temperature distribution in an industrial brick due to the energy supply of drying-air flowing inner it turbulent regime. In Chapter 7, Zagorščak and Thomas present the results of an experimental investigation on gas flow and Klinkenberg effect in coal. This is followed by Chapter 8 by Teixeira de Brito et al, who present a study of heat and mass transfer in solids with parallelepiped shape with particular reference to drying process. In Chapter 9, Guimarães et al. present three case studies related to the treatment of rising damp phenomenon in historical buildings. In Chapter 10, Barreira and Delgado present an analyse of the applicability of infrared thermography, a non-destructive technique, to assess moisture in building components. Finally, in Chapter 11, Paula et al. present a numerical analysis of hygrothermal building performance of gypsum houses in different Brazilian regions.

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