Preface

The purpose of this Volume 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 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, as well as related material properties and their measurements. This volume contents include both theoretical and experimental 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 in several 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, Prof. Pereira and colleagues presents a numerical analysis of heat and mass transport during drying of grains with particular reference to bean and rough rice. In Chapter 2, Prof. Delgado discuss a method for determining the coefficient of transverse dispersion in flow through packed beds, which is based on the measurement of the rate of dissolution of planar or cylindrical surfaces, buried in the bed and aligned with the flow direction. In Chapter 3, Professors Delgado and Vázquez da Silva report the use of Darcy flow theory for mass transfer around a sphere buried in a granular bed to numerically obtain the concentration boundary layer thickness of a soluble sphere over a wide range of values of relevant parameters. This is followed by Chapter 4 by Professors Malico and Ferreira de Sousa who presents the extension of a compact finite difference immersed boundary method for the detailed calculation of fluid flow and heat transfer in porous media. In Chapter 5, Prof. Almeida Cruz and colleagues presents a theoretical and experimental study about water absorption in unsaturated polyester polymer composites reinforced with vegetable fibers, with particular reference to macambira fiber. In Chapter 6, Professors Kacur and Minár present a method for the determination of the hydraulic permeability for flow in partially saturated porous media. This is followed by Chapter 7 by Prof. Barreira and colleagues who present a detailed analysis of the drying kinetics of solid red bricks. In Chapter 8, Prof. Almeida and colleagues analyse the hygrothermal performance and degradation of gypsum houses in different Brazilian climates. In Chapter 9, Prof. Miguel presents the key mechanisms behind pedestrian dynamics, namely individual and collective patterns of motion. In Chapter 10, Prof. Gorbachev and colleagues simulate the precipitates evolution in steels with Nb and V, in which two carbonitride phases can coexist. Finally, in Chapter 11, Prof. Freitas and colleagues presents a detailed case study to evaluate the performance over time of adhesive systems for bonding ceramic tiles used on the façades of a building located near the sea.

J.M.P.Q. Delgado