Preface

The purpose of this Volume, entitled “Heat Transfer and Fluid Flow in Separation and Transport Processes”, is to provide a collection of recent trends, developments, and applications in the field of separation and transport processes and energy, namely the advanced numerical simulation of heat transport and fluid flow in porous materials.

The heat and moisture transport and the separation of gaseous and liquid solutions into their components have always been an integral part of the manufacture of products in the chemical, petroleum, food, and pharmaceutical industries. As environmental protection has become an increasingly important consideration to industry, separation processes have become more important in direct proportion. This book includes a several number of chapters that discuss some of the most important theoretical advances, computational developments, and technological applications of separation processes.

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, agricultural, mechanical, and civil engineering, etc. The book is divided into 8 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, Albuquerque *et al.* provide the results of an extensive experimental campaign with different cycles of water absorption, capillarity absorption tests, and drying tests. The samples of building materials were submitted to capillarity absorption tests with two different saturated solutions, sodium sulphate and potassium chloride. In Chapter 2, Prado *et al*. focus on the study of the moisture diffusion in infrared drying of residual seeds from passion fruit processing. The effective moisture diffusivity in the particles was determined from experimental drying kinetics using two different approaches, in which it is considered either as a constant parameter during the process or as dependent on moisture ratio. This is followed by Chapter 3, by Nunes *et al.* who present a numerical study to address the flow of fluids inside a hydrocyclone equipped with a porous wall and containing two tangential inlets and two concentric outlets, with the aim of studying the impact of the formation of the polarization layer by concentration on the oily water separation process. In Chapter 4, Júnior *et al.* provide a numerical analysis for heat transfer in a duct with geometry circular annular elliptical using the Galerkin-based integral method. The analysis was performed for different geometries of the duct and the method was validated for circular cylindrical geometry. In Chapter 5, Araújo *et al.* present another numerical analysis in order to predict heat and mass transfer in the drying of ceramic bricks in the oven using computational fluid dynamics. Considering the constant thermophysical properties, a transient three-dimensional mathematical model was used to predict mass and energy transfer between the material and air during the process. This is followed by Chapter 6, by Barbosa de Lima *et al*. who present a numerical study of the core-annular flow of oil, water, and gas in a cylindrical duct with an elliptical cross-section, considering a three-dimensional, isothermal, and incompressible flow follows this. In Chapter 7, Oliveira *et al*. analysed numerically the feasibility of a PV solution that intends to take advantage of the hot air, indirectly produced by it, for subsequent heating of a house. Numerical simulations were performed using Ansys Fluent software and considering a 3D model of a house with PV panels installed on the roof. Finally, in Chapter 8, Teixeira *et al*. present a brief analysis of active and passive solutions for an energy-efficient building. A set of active and passive solutions were identified and presented in order to analyse the thermal performance of a residential building, that want to be energetically autonomous. EnergyPlus software was used to execute the thermo-energetic simulations for different scenarios.

J.M.P.Q. Delgado
A.G. Barbosa de Lima