Preface

The purpose of this Volume, entitled “Transport Phenomena in Single and Multiphase Systems: New Developments at Different Fields”, is to provide a collection of recent contributions in the field of transport and fluid flow phenomena in multiphase systems. This volume contents provides a self-contained of major reference that is appealing to both the scientists and the engineers.

The development of engineering in the course of centuries meant a constant struggle with available materials and a better understanding of the transport phenomena in multiphase systems, namely, heat and mass transfer. The purpose of this volume is to provide a collection of recent trends, developments, and applications in the field of transport phenomena in multiphase systems. This book includes a several number of chapters that discuss some of the most important theoretical advances, computational developments and technological applications of heat and mass transfer and fluid flow phenomena at different engineering fields.

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 10 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, Azevedo *et al.* provide an experimental study of the influence of lime solution on the bonding strength of a mortar coating base. The purpose of this work was to evaluate, in a comparative way, the direct tensile strength of bond of a mortar coating applied to the same base, preceded in its application by five different preparation techniques. In Chapter 2, Brito Correia *et al*. focuses on the study, numerically, the influence of the absolute rock permeability on the oil recovery of a complex geometry oil reservoir, using water injection with the black oil model. From the predicted results, it was concluded that the lowest absolute permeability used presented better oil recovery conditions for all production wells, with final VPOR per VPI varying between about 0.22 and 0.42, depending on the well locations. This is followed by Chapter 3, by Fernandes Magalhães *et al.* who present a hydrodynamic study of the water/oil separation process in a hydrocyclone by Computational Fluid Dynamics (CFD). It was possible to conclude that the proposed mathematical model was able to predict separation performance and the three-dimensional behavior of the phases flow analyzed (water/oil) in the hydrocyclone. In Chapter 4, Fernandes Magalhães *et al.* provide a numerical study of the water/oil separation process through the tubular ceramic membrane. The results obtained demonstrate that the developed model was able to predict the behavior of the water/oil separation process through the membrane, evidencing the influence of the oil particle size under the formation of the polarization layer by concentration. In Chapter 5, Oliveira *et al.* present a numerical study of the flow of oil and water in cylindrical ducts with an elliptical cross-section by using the Ansys CFX software. Results of the velocity, pressure and volumetric fraction distributions of the oil and water phases are presented and analyzed. This is followed by Chapter 6, by Verusca de Oliveira Lopes *et al.* who present an analysis of the performance of a concentrating hydrocyclone in the separation of ore and water by CFD. In the fluid dynamics simulation, the Eulerian-Lagrangian approach and the Ansys Fluent software were used. Results of pressure, velocity, and volumetric fraction fields of the involved phases are presented and evaluated in detail. In Chapter 7, Cordeiro Carvalho *et al.* propose a two-dimensional mathematical model to describe the solidification process of a Ni-Ti alloy in stainless steel metal mold sand-confined. Results of the Ni-Ti alloy and mold temperature distributions over time are presented and analyzed. In Chapter 8, Moura da Silva *et al.* present a transient three-dimensional mathematical model using cylindrical-elliptic coordinate system and thermo-physical properties as functions of the position or temperature. The aim is to predict heat transfer in an elliptic-cylindrical fixed bed reactor subjected to a chemical reaction of first order whose heat of reaction is given by the power law. In Chapter 9, Nascimento

Porto *et al.* present a mathematical modeling of the resin transient flow inside a mold where metal wires are located and the numerical solution that describes the problem, through calculations of volumetric fractions, velocity and pressure fields, and the fluid dynamic aspects that characterize the liquid molding process. Finally, in Chapter 10, Azevedo *et al*. present a new methodology to determine the hygric permeance in multilayer building materials based in an automatic, and more correct, detection of the "knee point".

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