

# Table of Contents

## Preface

## Chapter 1: Diffusion Phenomena on Nanoscale

<b>Nanostructure Development of Al-Fe Eutectic Alloy</b>	
A. Hu, S.F. Liu, W.T. Shen, L. Ying and H. Hu	3
<b>Modelling the Non-Isothermal Flow of a Nanofluid in a Lid-Driven Cavity from the Perspective of Irreversibility Analysis</b>	
E.R. di Schio, K. Iqbal, P. Valdiserri, M. Bouanini and C. Biserni	13
<b>Electrochemical Potentials of Cobalt Oxide Nanofluid for Improved Oil Recovery with the Aid of Electromagnetic Field</b>	
H. Soleimani, S. Sikiru, H. Soleimani, A. Rostami, L. Khodapanah, M. Yeganeh Ghotbi, N. Rahamanian and M. Sabet	23

## Chapter 2: Mathematical Modelling and Simulations

<b>Niobium Solubility in Austenite in the Presence of Niobium Carbides, Nitrides and Carbonitrides</b>	
P.R. Mei	35
<b>Numerical Simulation of Metallurgical Joining of AISI 304 Steel and Ti Grade 2</b>	
E. Babalová and M. Behúlová	53
<b>Study for Hydrogen-Permeable Pd Membrane Using First-Principles Calculation</b>	
K. Ogawa, D. Horikawa, K. Hakamata, T. Nakazawa and S. Kubota	63
<b>An Investigation of Pedestrian Dynamics Based on Fluid Mechanics Dimensionless Numbers</b>	
A.F. Miguel	73
<b>Geochemical Impacts on CO<sub>2</sub> Storage Efficiency in Deep Aquifers: A Cameroon Gulf of Guinea Case Study</b>	
G. Mwenketishi, H. Benkreira, H. Soleimani and N. Rahamanian	83
<b>Thermodynamic Modeling of Iron Ore Reduction Using Synthesis Gas</b>	
A.N. Dmitriev, N.M. Barbin, Y.E. Burova and G.Y. Vitkina	93

## Chapter 3: Experimental Methods in Solids and Liquids

<b>Interdiffusion in β Phase Field of Ternary (Ni, Ru)Al System</b>	
S. Kumar and K.N. Kulkarni	105
<b>Synthesis of Composite Materials Based Eggshell Reinforced with Silver Nanoparticles for Possible Biomedical Applications</b>	
A. Linares Duarte, E.H. Sánchez, J.G.M. Hernández, Y.S. Fuentes and J.J. Ruíz Domínguez	115
<b>Measurements of Diffusion Coefficients in Liquid Alloys Using Two Measurement Points of In Situ X-Ray Fluorescence Analysis</b>	
Y. Kobayashi, M. Shiinoki, T. Masaki and S. Suzuki	127
<b>A Study of Diffusion Coefficients: Database and New Device</b>	
A. Ribet, P. Jardin and M. Lalande	139
<b>Induced Residual Stress in Austenitic Stainless Steel F138 after Shot Peening and Plasma Nitriding Surface Treatment</b>	
E.P.R. de Oliveira, R.R. de Oliveira, J.G. Vicente, M. Massi and A.A. Couto	147
<b>Pseudoboehmite for Metformin Release</b>	
E. Lazarin Jr., J.M.B. Silveira, P.C.M. Oliveira, R.M. Peres, I. Barbosa, R.R. Ribeiro, B. Sarmento, A. Bernussi and A.H. Munhoz Jr.	157
<b>Effect of Processing and Heat Treatment on the Color of the Water Atomized Steel Shots of High Carbon Steel</b>	
M. Lee, N.E. Battulga and K. Shin	165

<b>Ti-5Mo-xNb Alloys Obtained by Laser Deposition with Potential Use as Biomaterials</b>	179
R. Emilio, C.J.R. Lustosa, A. Almeida and O. Florêncio	
<b>Multicomponent Diffusion in Seven- and Eight-Component Silicate Melts</b>	189
Y.X. Zhang	
<b>Microstructural Degradation of Super304H after Long-Term Service Exposure</b>	209
L.M. Xu, Y.S. He and K. Shin	
<b>Evaluation of Tribological Performance of TiN Films Doped with Copper Deposited by Magnetron Sputtering</b>	221
S.N.F. Ribeiro, F.M.d.A. Pereira, R.L.P. Gonçalves, C.A. Monezi, A.A. Couto, K.G. Grigorov and M. Massi	
<b>Exploration of Microfluidic Technology for Additive Manufacturing: Devices for Precise Material Dispensing</b>	233
E.O. Alvarado-Alcántara, J.A. Beltrán-Fernández, A.T. Velázquez-Sánchez, K.P. Vázquez-Thierry, V. Guzmán-Mercado and C. Alvarado-Moreno	
<b>Validation of Velocity in Microchannels with a Retention System due to Unevenness Manufactured by 3D Printing (SLA)</b>	243
S.A. Ramos-Ocaña and V.H. Cabrera-Moreta	

## Chapter 4: Thermal Diffusion in Solids and Liquids

<b>Numerical and Experimental Analysis of the Temperature Fields Developed during WAAM Production of an Aluminum Part</b>	263
M. Behúlová, M. Sahul, E. Babalová, M. Sahul and T. Němec	
<b>Performance Characterization of Cascade Mr-Joule-Thomson Refrigeration System Based on Refrigerant Charge Level</b>	273
C.H. Choi, J.W. Bae, S.H. Seol, C.H. Son and J.I. Yoon	
<b>Numerical Evaluation of the Temperature Field inside Specialty Coffee Beans during Microwave Drying</b>	283
J.L.G. Corrêa, L.Q. Monteiro, P.G. Silveira and I. Petri Jr.	
<b>Improvement of Interference Fringes Analysis to Obtain Accurate Soret Coefficients</b>	291
H. Horikoshi, I. Orikasa, M. Kataoka, Y. Inatomi and S. Suzuki	