Manabu Iguchi Olusegun J. Ilegbusi

Modeling Multiphase Materials Processes

Gas-Liquid Systems



<u>Modeling Multiphase Materials Processes Gas Liquid</u> <u>Systems</u>

Hafiz Muhammad Ali

Modeling Multiphase Materials Processes Gas Liquid Systems:

Modeling Multiphase Materials Processes Manabu Iguchi, Olusegun J. Ilegbusi, 2010-11-10 Modeling Multiphase Materials Processes Gas Liquid Systems describes the methodology and application of physical and mathematical modeling to multiphase flow phenomena in materials processing The book focuses on systems involving gas liquid interaction the most prevalent in current metallurgical processes The performance characteristics of these processes are largely dependent on transport phenomena This volume covers the inherent characteristics that complicate the modeling of transport phenomena in such systems including complex multiphase structure intense turbulence opacity of fluid high temperature coupled heat and mass transfer chemical reactions in some cases and poor wettability of the reactor walls Also discussed are solutions based on experimental and numerical modeling of bubbling jet systems recent advances in the modeling of nanoscale multi phase phenomena and multiphase flows in micro scale and nano scale channels and reactors Modeling Multiphase Materials Processes Gas Liquid Systems will prove a valuable reference for researchers and engineers working in mathematical modeling and materials processing Flow Visualization in Materials Processing Tomomasa Uemura, Yoshiaki Ueda, Manabu Iguchi, 2017-10-05 This book presents a comprehensive review of particle image velocimetry PIV and particle tracking velocimetry PTV as tools for experimental fluid dynamics EFD It shares practical techniques for high speed photography to accurately analyze multi phase flows in particular it addresses the practical know how involved in high speed photography including e g the proper setup for lights and illumination optical systems to remove perspective distortion and the density of tracer particles and their fluorescence in the context of PIV and PTV In this regard using the correct photographic technique plays a key role in the accurate analysis of the respective flow Practical applications include bubble and liquid flow dynamics in materials processes agitated by gas injection at high temperatures mixing phenomena due to jet induced rotary sloshing and wettability effects on the efficiency of the processes An Introduction to Chemical Process Design Bart Hallmark, 2021-10-21 This book derives from a course on chemical process design that I taught at the University of Cambridge UK between 2008 and 2018 and is intended to serve as a basic introduction to a number of disciplines within the topic Given the immense breadth and depth of this subject the aim of this book is to introduce and illustrate certain key points and concepts and to provide a template workflow for certain procedures such as gaseous relief header design or distillation optimisation Reference is made to specialist design manuals for specific topics such that more information can be obtained by the reader where necessary The aim of this book is not to provide a definitive reference for all design scenarios but rather to act as an introductory guide The book was originally written for undergraduate students embarking on their design project but it is also intended to serve as a succinct reference guide to existing practitioners **Basic Transport** Phenomena in Materials Engineering Manabu Iguchi, Olusegun J. Ilegbusi, 2013-09-12 This book presents the basic theory and experimental techniques of transport phenomena in materials processing operations Such fundamental knowledge is

highly useful for researchers and engineers in the field to improve the efficiency of conventional processes or develop novel technology Divided into four parts the book comprises 11 chapters describing the principles of momentum transfer heat transfer and mass transfer in single phase and multiphase systems Each chapter includes examples with solutions and exercises to facilitate students learning Diagnostic problems are also provided at the end of each part to assess students comprehension of the material The book is aimed primarily at students in materials science and engineering However it can also serve as a useful reference text in chemical engineering as well as an introductory transport phenomena text in mechanical engineering In addition researchers and engineers engaged in materials processing operations will find the material useful for the design of experiments and mathematical models in transport phenomena This volume contains unique features not usually found in traditional transport phenomena texts It integrates experimental techniques and theory both of which are required to adequately solve the inherently complex problems in materials processing operations It takes a holistic approach by considering both single and multiphase systems augmented with specific practical examples There is a discussion of flow and heat transfer in microscale systems which is relevant to the design of modern processes such as fuel cells and compact heat exchangers Also described are auxiliary relationships including turbulence modeling interfacial phenomena rheology and particulate systems which are critical to many materials processing operations Materials based Thermally Enhanced Phase Change Materials Hafiz Muhammad Ali, 2024-04-12 Advanced Materials based Thermally Enhanced Phase Change Materials Fundamentals and Applications focuses on the use of advanced materials to enhance the thermal characteristics of phase change materials used to maximize heat transfer rate and thermal storage capability of PCMs This book covers the various aspects of PCMs through characteristics and preparation to heat transfer enhancement with emphasis on prominent applications This book will progress from cover brief history literature review definitions recent advances preparation techniques thermophysical properties and heat transfer characteristics with mathematical models performance affecting factors and applications and challenges of PCMs in manufacturing A powerful tool for researchers and energy engineers Advanced Materials based Thermally Enhanced Phase Change Materials Fundamentals and Applications offers cutting edge materials advances analysis and applications of phase change materials in manufacturing Provides an in depth explanation of phase change materials PCMs heat transfer and thermal characteristics and applications Covers applications and challenges for commercialization Explores advanced materials such as nanoparticles graphene carbon nanotubes MXene metallic foams and micro fins Process Modeling in Pyrometallurgical Engineering Henrik Saxén, Marco A. Ramírez-Argáez, Alberto N. Conejo, Abhishek Dutta, 2021-09-01 The Special Issue presents almost 40 papers on recent research in modeling of pyrometallurgical systems including physical models first principles models detailed CFD and DEM models as well as statistical models or models based on machine learning The models cover the whole production chain from raw materials processing through the reduction and conversion unit processes

to ladle treatment casting and rolling The papers illustrate how models can be used for shedding light on complex and inaccessible processes characterized by high temperatures and hostile environment in order to improve process performance product quality or yield and to reduce the requirements of virgin raw materials and to suppress harmful emissions

Microchemical Engineering and Technology Guangsheng Luo, Kai Wang, Jian Deng, 2025-07-01 Microchemical Engineering and Technology focuses on the development basic principles characteristics and advantages of micro chemical technology. The book summarizes the basic laws of micro scale single phase flow the micro scale mixing process and the enhancement of micro scale mixing performance. It introduces gas liquid liquid and gas liquid liquid micro dispersion equipment and dispersion law micro scale heat mass transfer performance as well as homogeneous and heterogeneous micro scale reactions micro scale absorption extraction and reaction processes enhancement technology. For the application of microchemical technology in the area of material interpretation nano material preparation technology fiber material preparation technology and special structure material preparation technology are introduced. Final content describes typical cases of industrial applications of gas liquid absorption micro chemical equipment liquid liquid extraction micro chemical equipment and chemical synthesis micro chemical equipment. Characterizes the close integration of theory and practice. Discusses basic theories of micro chemical technology.

Applied Mechanics Reviews ,1980 **Advanced Applications in Heat Exchanger Technologies** Sunil Kumar, Kavita Rathore, Debjyoti Banerjee, 2025-08-13 Advanced Applications in Heat Exchanger Technologies presents the most recent developments in enhancing heat exchanger performance reliability and resilience including the implementation of Artificial Intelligence Machine Learning and Additive Manufacturing Covering the essential parts of many commercial endeavors ranging from aerospace to marine applications to oil and gas the book discusses various heat exchanger types and interdisciplinary industry applications It encompasses several different techniques such as nanofluids microchannel heat exchangers computer modeling advanced manufacturing and optimization The book addresses real world concerns that impact long term heat exchanger performance and dependability such as fouling corrosion prevention and maintenance measures This book is intended for researchers and graduate students who are interested in heat exchangers R D and the diverse range of industrial applications of heat exchanger technologies in contemporary practice Mesoscale Modeling in Chemical Engineering Part I, 2015-11-26 Focusing Mesoscales of Multiscale Problems in Chemical Engineering a volume in the Advances in Chemical Engineering series provides readers with the personal views of recognized authorities who present assessments of the state of the art in the field and help readers develop an understanding of its further evolution Subjects covered in the book are not limited to the classical chemical engineering disciplines Contributions connecting chemical engineering to related scientific fields either providing a fundamental basis or introducing new concepts and tools are encouraged This volume aims to create a balance between well developed areas such as process industry transformation of

materials energy and environmental issues and areas where applications of chemical engineering are more recent or emerging Contains reviews by leading authorities in their respective areas Provides up to date reviews of the latest techniques in the modeling of catalytic processes Includes a broad mix of US and European authors as well as academic industrial research institute perspectives Provides discussions on the connections between computation and experimental methods

Modeling Multiphase Materials Processes Gas Liquid Systems Book Review: Unveiling the Magic of Language

In a digital era where connections and knowledge reign supreme, the enchanting power of language has become more apparent than ever. Its capability to stir emotions, provoke thought, and instigate transformation is truly remarkable. This extraordinary book, aptly titled "Modeling Multiphase Materials Processes Gas Liquid Systems," written by a very acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound affect our existence. Throughout this critique, we shall delve in to the book is central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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