Transport Phenomena In Materials Processing Poirier

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.

Transport Phenomena in Dispersed

Media addresses the main problems associated with the transfer of heat, mass and momentum. The authors focus on the analytical solutions of the mass and heat transfer equations; the theoretical problems of coalescence, coagulation, aggregation and fragmentation of

dispersed particles; the rheology of structured aggregate and kinetically stable disperse systems; the precipitation of particles in a turbulent flow; the evolution of the distribution function; the stochastic counterpart of the mass transfer equations; the dissipation of energy

in disperse systems; and many other problems that distinguish this book from existing publications. Key Selling Features Covers all technological processes taking place in the oil and gas complex, as well as in the petrochemical industry Presents new original solutions for

calculating design as well as for the development and implementation of processes of chemical technology Organized to first provide an extensive review of each chapter topic, solve specific problems, and then review the solutions with the reader Contains complex

mathematical expressions for practical calculations Compares results obtained on the basis of mathematical models with experimental data

The understanding and control of transport phenomena in materials processing play an important role in

the improvement of conventional processes and in the development of new techniques. Computer modeling of these phenomena can be used effectively for this purpose. Although there are several books in the literature covering the analysis of heat tra

Transport Phenomena in Manufacturing and Materials Processing

Transport Phenomena in Materials Processing, 1990

Transport Phenomena in Food Processing

Presented at the 6th AIAA/ASME

Thermophysics and Heat Transfer Conference, Colorado Springs, Colorado, June 20-23, 1994

An extremely useful guide to the theory and applications of transport phenomena in materials processing This book defines the unique role that transport phenomena play in materials

processing and offers a graphic, comprehensive treatment unlike any other book on the subject. The two parts of the text are, in fact, two useful books. Part I is a very readable introduction to fluid flow, heat transfer, and mass transfer for materials engineers and anyone not yet

thoroughly familiar with the subject. It includes governing equations and boundary conditions particularly useful for studying materials processing. For mechanical and chemical engineers, and anyone already familiar with transport phenomena, Part II covers the many specific applications to

materials processing, including a brief description of various materials processing technologies. Readable and unencumbered by mathematical manipulations (most of which are allocated to the appendixes), this book is also a useful text for upper-level undergraduate and graduate-level

courses in materials, mechanical, and chemical engineering. It includes hundreds of photographs of materials processing in action, single and composite figures of computer simulation, handy charts for problem solving, and more. Transport Phenomena and Materials Processing:

Describes eight key materials processing technologies, including crystal growth, casting, welding, powder and fiber processing, bulk and surface heat treating, and semiconductor device fabrication Covers the latest advances in the field, including recent results of computer

simulation and flow visualization Presents special boundary conditions for transport phenomena in materials processing Includes charts that summarize commonly encountered boundary conditions and step-by-step procedures for problem solving Offers a unique derivation of governing

equations that leads to both overall and differential balance equations
Provides a list of publicly available computer programs and publications relevant to transport phenomena in materials processing
Motivated by international competition and an easy access to high-speed

computers the manufacturing and materials processing industry has seen many changes in recent times. New techniques are constantly being devloped based on a broad range of basic sciences including physics, chemistry and particularly thermal-fluids sciences and kinetics. In order to

produce and treat massive products, the industry is also in need of a very wide range of engineering knowledge and skill for integrating metallurgy, mechanics, electricity, transport phenomena, instrumentation and computer control. This monograph covers a part of these demands,

namely by presenting the available knowledge on transport phenomena in manufacturing and materials processing. It is divided into four parts. Part I deals with the fundamentals of transport phenomena, including the transfer of momentum, energy, mass, electric and magnetic properties. Parts

II and III are concerned with applications of the fundamentals in transport phenomena occurring in manufacturing and materials processing, respectively. Emphasis has been placed on common aspects of both disccIplines, such as forming, machining, welding, casting, injection

molding, surface processes, heating and cooling, solidification, crystal growth and diffusion. Part IV deals with beam technology and microgravity, two topics of current importance.

Rotary Kilns—rotating industrial drying ovens—are used for a wide variety of

applications including processing raw minerals and feedstocks as well as heat-treating hazardous wastes. They are particularly critical in the manufacture of Portland cement. Their design and operation is critical to their efficient usage, which if done incorrectly can result in improperly

treated materials and excessive, high fuel costs. This professional reference book will be the first comprehensive book in many years that treats all engineering aspects of rotary kilns, including a thorough grounding in the thermal and fluid principles involved in their operation, as well as how to

properly design an engineering process that uses rotary kilns. Chapter 1: The Rotary Kiln Evolution & Phenomenon Chapter 2: Basic Description of Rotary Kiln Operation Chapter 3: Freeboard Aerodynamic Phenomena Chapter 4: Granular Flows in Rotary Kilns Chapter 5:

Mixing & Segregation Chapter 6: Combustion and Flame Chapter 7: Freeboard Heat Transfer Chapter 8: Heat Transfer Processes in the Rotary Kiln Bed Chapter 9: Mass & Energy Balance Chapter 10: Rotary Kiln Minerals Process Applications ·Covers fluid flow, granular flow, mixing and

segregation, and aerodynamics during turbulent mixing and recirculation ·Offers hard-to-find guidance on fuels used for rotary kilns, including fuel options such as natural gas versus coal-fired rotary kilns ·Explains principles of combustion and flame control, heat transfer and heating and

material balances

Transport Phenomena and Transport Processes

Presented at the 28th National Heat Transfer Conference and Exhibition, San Diego, CA, August 9-12, 1992

Transport Phenomena and Materials Processing

Transport Phenomena in Materials Processing, Solutions Manual

Transport Phenomena in Materials ProcessingSpringer

Transport phenomena are the processes and rules by which heat, mass, and

momentum move through and between materials and systems. Along with thermodynamics, mechanics, and electromagnetism, this body of knowledge and theory forms the core

principals of all physical systems and is essential to all engineering disciplines. This new edition of a classic work on how transport phenomena behave in materials and materials

systems will provide expanded coverage and up-to-date theory and knowledge from today's research on heat transfer and fluid behavior, with ample examples of practical

applications to materials processing and engineering. Professional engineers and students alike will find one of the clearest and most accessible approaches to an often difficult and

challenging subject. Logical pedagogy, with clear applications to real materials engineering problems will make more vivid the abstract body of knowledge that comprises today's

understanding of transport phenomena. Readers will find: A new chapter on boiling and condensation Revised chapters on heat transport, mass transport in solid state and mass

transport in fluids Revised and expanded end-of-chapter problems and exercises S.I. Units throughout Extensive Appendices of standard materials properties For

classroom use, a Solutions Manual is available

This text provides a teachable and readable approach to transport phenomena by providing numerous examples and

applications. The text leads the reader through the development and solution of relevant differential equations by applying familiar principles of conservation to numerous

situations and by including many worked examples in each chapter. The book is organized similarly to other texts in transport phenomena. Section I deals with the properties and

mechanics of fluid motion; Section II with thermal properties and heat transfer; and Section III with diffusion and mass transfer. The authors depart from tradition by building on a presumed

understanding of the relationships between the structure and properties of matter, particularly in the chapters devoted to the transport properties. Generous portions of the

text, numerous examples, and many problems apply transport phenomena to materials processing. Transport Phenomena in Materials Processing and Manufacturing, 1996

Advanced Heat and Mass Transfer

Presented at the Winter Annual Meeting of the American Society of Mechanical Engineers, Boston, Massachusetts,

November 13-18, 1983

Materials Kinetics

Transport Phenomena of Foods and Biological Materials provides comprehensive coverage of transport phenomena modeling in foods and other biological

materials. The book is unique in its consideration of models ranging from rigorous mathematical to empirical approaches, including phenomenological and semi-empirical models. It examines cell structure and descriptions of other

non-traditional models, such as those based on irreversible thermodynamics or those focused on the use of the chemical and electrochemical potential as the driving forces of transport. Other topics discussed include the source

term (important for the coupling transport phenomena-reaction or other intentional/unintentional phenomena) and the connections between transport phenomena modeling and design aspects. Some 100 tables provide useful summaries

of the characteristics of each model and provide data about the transport properties of an extensive variety of foods. Transport Phenomena of Foods and Biological Materials will benefit a broad audience of chemists, biochemists,

biotechnologists, and other scientists in the academic and industrial realm of foods and biological materials.

This classic text on fluid flow, heat transfer, and mass transport has been brought up to date in this

second edition. The author has added a chapter on "Boiling and Condensation" that expands and rounds out the book's comprehensive coverage on transport phenomena. These new topics are particularly important to

current research in renewable energy resources involving technologies such as windmills and solar panels. The book provides you and other materials science and engineering students and professionals with a clear yet

thorough introduction to these important concepts. It balances the explanation of the fundamentals governing fluid flow and the transport of heat and mass with common applications of these fundamentals to specific systems

existing in materials engineering. You will benefit from: • The use of familiar examples such as air and water to introduce the influences of properties and geometry on fluid flow. • An organization with sections dealing separately with

fluid flow, heat transfer, and mass transport. This sequential structure allows the development of heat transport concepts to employ analogies of heat flow with fluid flow and the development of mass transport concepts to employ

analogies with heat transport. • Ample high-quality graphs and figures throughout. • Key points presented in chapter summaries. • End of chapter exercises and solutions to selected problems. • An all new and improved

comprehensive index.

This introduction to transport phenomena in materials engineering balances an explanation of the fundamentals governing fluid flow and the transport of heat and mass with their common applications to

specific systems in materials engineering. It introduces the influences of properties and geometry on fluid flow using familiar fluids such as air and water. Covers topics such as engineering units and pressure in

static fluids; momentum transport and laminar flow of Newtonian fluids; equations of continuity and conservation of momentum and fluid flow past submerged objects; turbulent flow; mechanical energy balance and its application to fluid

flow; transport of heat by conduction; transport of heat by convection; transient heat flow; heat transport by thermal radiation; mass transport in the solid state by diffusion; mass transport in fluids. Includes extensive appendices.

Transport Phenomena in Materials Processing

Transport Phenomena in Materials Processing and Manufacturing, 1994

Solutions Manual

Transport Phenomena in Dispersed

Media

This text provides a teachable and readable approach to transport phenomena (momentum, heat, and mass transport) by providing numerous examples and applications, which

are particularly important to metallurgical, ceramic, and materials engineers. Because the authors feel that it is important for students and practicing engineers to visualize the physical situations, they have attempted to

lead the reader through the development and solution of the relevant differential equations by applying the familiar principles... This book provides a thorough overview of transport phenomena in complex fluids, based on the

latest research results and the newest methods for their analytical prediction and numerical simulation. The respective chapters cover several topics, including: a description of the structural features of the most

common complex fluids (polymer and surfactant solutions, colloidal suspensions); an introduction to the most common non-Newtonian constitutive models and their relationship with the fluid microstructure; a detailed

overview of the experimental methods used to characterise the thermophysical properties, bulk rheology, and surface properties of complex fluids; a comprehensive introduction to heat, mass, and momentum

transport, and to hydrodynamic instabilities in complex fluids; and an introduction to state-of-the-art numerical methods used to simulate complex fluid flows, with a focus on the Smoothed Particle Hydrodynamics (SPH) and the

Dissipative Particle Dynamics (DPD) techniques. Subsequent chapters provide in-depth descriptions of phenomena such as thermal convection, elastic turbulence, mixing of complex fluids, thermophoresis,

sedimentation, and non-Newtonian drops and sprays. The book addresses research scientists and professionals, engineers, R&D managers and graduate students in the fields of engineering, chemistry, biology,

medicine, and the applied and fundamental sciences.
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examples and applications, which are particularly important to metallurgical, ceramic, and materials engineers. Because the authors feel that it is important for students and practicing engineers to visualize the physical

situations, they have attempted to lead the reader through the development and solution of the relevant differential equations by applying the familiar principles of conservation to numerous situations and by including many

worked examples in each chapter. The book is organized in a manner characteristic of other texts in transport phenomena. Section I deals with the properties and mechanics of fluid motion; Section II with thermal properties

and heat transfer; and Section III with diffusion and mass transfer. The authors depart from tradition by building on a presumed understanding of the relationships between the structure and properties of matter, particularly in

the chapters devoted to the transport properties (viscosity, thermal conductivity, and the diffusion coefficients). In addition, generous portions of the text, numerous examples, and many problems at the ends of the

chapters apply transport phenomena to materials processing.
Aspects of Micro/Macro Behaviour
Transport Phenomena in Materials Processing and

Manufacturing

Symposium : Winter Annual Meeting : Papers

Solutions Manual to Accompany Transport Phenomena in Materials Processing

Materials Kinetics: Transport and

Rate Phenomena provides readers with a clear understanding of how physical-chemical principles are applied to fundamental kinetic processes. The book integrates advanced concepts with foundational knowledge and

cutting-edge computational approaches, demonstrating how diffusion, morphological evolution, viscosity, relaxation and other kinetic phenomena can be applied to practical materials design problems across all classes of

materials. The book starts with an overview of thermodynamics, discussing equilibrium, entropy, and irreversible processes. Subsequent chapters focus on analytical and numerical solutions of the diffusion equation, covering

Fick's laws, multicomponent diffusion, numerical solutions, atomic models, and diffusion in crystals, polymers, glasses, and polycrystalline materials. Dislocation and interfacial motion, kinetics of phase separation,

viscosity, and advanced nucleation theories are examined next, followed by detailed analyses of glass transition and relaxation behavior. The book concludes with a series of chapters covering molecular dynamics, energy

landscapes, broken ergodicity, chemical reaction kinetics, thermal and electrical conductivities, Monte Carlo simulation techniques, and master equations. Covers the full breadth of materials kinetics, including

organic and inorganic materials, solids and liquids, theory and experiments, macroscopic and microscopic interpretations, and analytical and computational approaches Demonstrates how diffusion, viscosity microstructural

evolution, relaxation, and other kinetic phenomena can be leveraged in the practical design of new materials Provides a seamless connection between thermodynamics and kinetics Includes practical exercises that

reinforce key concepts at the end of each chapter

In this book, the fundamentals of chemical engineering are presented with respect to applications in micro system technology, microfluidics, and

transport processes within microstructures. Special features of the book include the state-of-the-art in micro process engineering, a detailed treatment of transport phenomena for engineers, and a design

methodology from transport effects to economic considerations.

Materials processing and manufacturing are fields of growing importance whereby transport phenomena play a

central role in many of the applications. This volume is one of the first collections of contributions on thesubject. The five papers cover a wide variety of applications

Computer Modelling of Heat and

Fluid Flow in Materials Processing
Presented at the 28th National Heat Transfer Conference and Exhibition, San Diego, California, August 9-12, 1992
Presented at the 1996 International Mechanical

Engineering Congress and Exposition, November 17-22, 1996, Atlanta, Georgia

Transport phenomena in materials processing. Papers ; 1990

This textbook offers an introduction to multiple, interdependent transport

phenomena as they occur in various fields of physics and technology like transport of momentum, heat, and matter. These phenomena are found in a number of combined processes in the fields of chemical, food, biomedical, and environmental sciences. The book

puts a special emphasis on numerical modeling of both purely diffusive mechanisms and macroscopic transport such as fluid dynamics, heat and mass convection. To favor the applicability of the various concepts, they are presented with a simplicity of

exposure, and synthesis has been preferred with respect to completeness. The book includes more than 130 graphs and figures, to facilitate the understanding of the various topics. It also presents many modeling examples throughout the text, to control that the

learned material is properly understood. There are some typos in the text. You can see the corrections here: http://www.springer.com/cda/content/document/cda_downloaddocument/ErrataCorrige_v0.pdf?SGWID=0-0-45-1679320-p181107156

Proceedings of the November 1996 symposium which included sessions on thermal transport in laser-materials interactions, laser-materials processing, transport phenomena in crystal growth, solidification, and melting, transport phenomena in

manufacturing and materials processing, and multiphase flow

This monograph presents an integrated perspective of the wide range of phenomena and processes applicable to the study of transport of species in porous materials. In order to formulate

the entire range of porous media and their uses, this book gives the basics of continuum mechanics, thermodynamics, seepage and consolidation and diffusion, including multiscale homogenization methods. The particular structure of the book

has been chosen because it is essential to be aware of the true properties of porous materials particularly in terms of nano, micro and macro mechanisms. This book is of pedagogical and practical importance to the fields covered by civil, environmental,

nuclear and petroleum engineering and also in chemical physics and geophysics as it relates to radioactive waste disposal, geotechnical engineering, mining and petroleum engineering and chemical engineering.

An Introduction to Transport

Phenomena in Materials Engineering
Transport Phenomena in Micro Process Engineering
12th Symposium on Transport Phenomena in Materials Processing and Manufacturing Processes
Specifically developed for food

engineers, this is an in-depth reference book that focuses on transport phenomena in food preservation. First it reviews the fundamental concepts regarding momentum, heat, and mass transfer. Then the book

examines specific applications of these concepts into a variety of traditional and novel processes and products.

A Multiphysics, General Equation-Based Approach

Transport Phenomena in

Complex Fluids
Basic Transport Phenomena in Materials Engineering
An Introduction to Transport Phenomena In Materials Engineering, 2nd edition