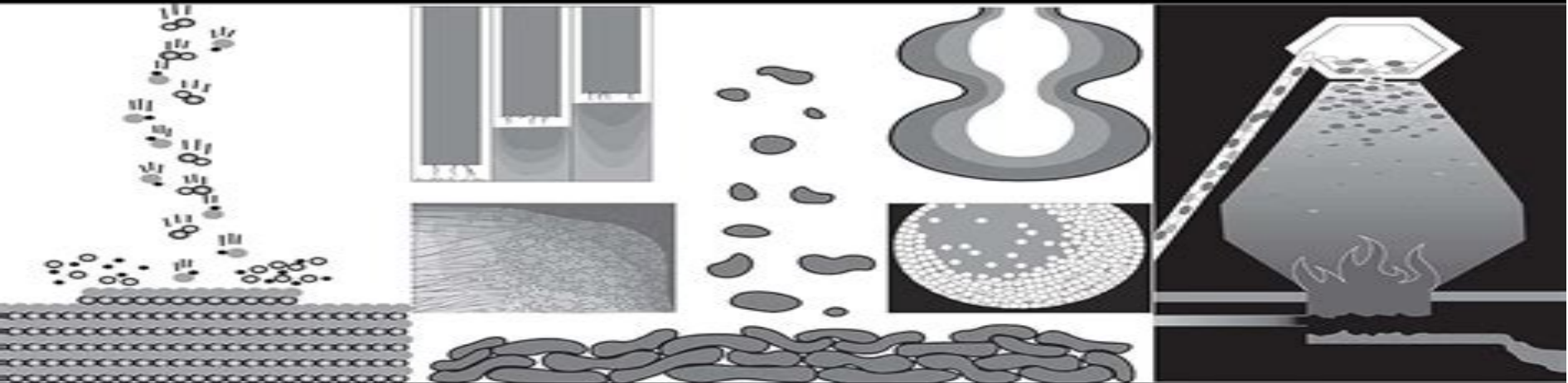


THIRD EDITION

An Introduction to Transport Phenomena in Materials Engineering



David R. Gaskell
Matthew John M. Krane



CRC Press
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This book elucidates the important role of conduction convection and radiation heat transfer mass transport in solids and fluids and internal and external fluid flow in the behavior of materials processes These phenomena are critical in materials engineering because of the connection of transport to the evolution and distribution of microstructural properties during processing From making choices in the derivation of fundamental conservation equations to using scaling order of magnitude analysis showing relationships among different phenomena to giving examples of how to represent real systems by simple models the book takes the reader through the fundamentals of transport phenomena applied to materials processing Fully updated this third edition of a classic textbook offers a significant shift from the previous editions in the approach to this subject representing an evolution incorporating the original ideas and extending them to a more comprehensive approach to the topic

FEATURES Introduces order of magnitude scaling analysis and uses it to quickly obtain approximate solutions for complicated problems throughout the book Focuses on building models to solve practical problems Adds new sections on non Newtonian flows turbulence and measurement of heat transfer coefficients Offers expanded sections on thermal resistance networks transient heat transfer two phase diffusion mass transfer and flow in porous media Features more homework problems mostly on the analysis of practical problems and new examples from a much broader range of materials classes and processes including metals ceramics polymers and electronic materials Includes homework problems for the review of the mathematics required for a course based on this book and connects the theory represented by mathematics with real world problems This book is aimed at advanced engineering undergraduates and students early in their graduate studies as well as practicing engineers interested in understanding the behavior of heat and mass transfer and fluid flow during materials processing While it is designed primarily for materials engineering education it is a good reference for practicing materials engineers looking for insight into phenomena controlling their processes A solutions manual lecture slides and figure slides are available for qualifying adopting professors

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Phase Transformation in Metals Nestor Perez,2020-09-25 This textbook explains the physics of phase transformation and associated constraints from a metallurgical or materials science point of view based on many topics including crystallography mass transport by diffusion thermodynamics heat transfer and related temperature gradients thermal deformation and even fracture mechanics The work presented emphasizes solidification and related analytical models based on heat transfer This corresponds with the most fundamental physical event of continuous evolution of latent heat of fusion for directional or non directional liquid to solid phase transformation at a specific interface with a certain geometrical shape such as planar or curved front Dr Perez introduces mathematical and engineering approximation schemes for describing the phase transformation mainly during solidification of pure metals and alloys Giving clear definitions and explanations of theoretical concepts and full detail of derivation of formulae this interdisciplinary volume is ideal for graduate and upper level undergraduate students in applied science and professionals in the metal making and surface reconstruction industries

Materials Processing Lorraine F. Francis,2024-04-25 *Materials Processing A Unified Approach to Processing of Metals Ceramics and Polymers* Second Edition is the first textbook to bring the fundamental concepts of materials processing together in a unified approach that highlights the overlap in scientific and engineering principles It teaches students the key principles involved in the processing of engineering materials specifically metals ceramics and polymers from starting or raw materials through to the final functional forms Its self contained approach is based on the state of matter most central to the shaping of the material melt solid powder dispersion and solution and vapor With this approach students learn processing fundamentals and appreciate the similarities and differences between the materials classes This fully updated edition includes expanded coverage on additive manufacturing as well as adding a new section on machining The organization has been modified and a greater emphasis has been placed on the fundamentals of processing and manufacturing methods This book can be utilized by upper level undergraduates and beginning graduate students in Materials Science and Engineering who are already schooled in the structure and properties of metals ceramics and polymers and are ready to apply their

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Electrochemistry and Corrosion Science Nestor Perez, 2007-05-08 Electrochemistry and Corrosion Science is a graduate level text professional reference that describes the types of corrosion on metallic materials The focus will be on modeling and engineering approximation schemes that describe the thermodynamics and kinetics of electrochemical systems The principles of corrosion behavior and metal recovery are succinctly described with the aid of pictures figures graphs and schematic models followed by derivation of equations to quantify relevant parameters Example problems are included to illustrate the application of electrochemical concepts and mathematics for solving complex corrosion problems This book differs from others in that the subject matter is organized around the modeling and predicating approaches that are used to determine detrimental and beneficial electrochemical events Thus this book will take a more practical approach and make it especially useful as a basic text and reference for professional engineers

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practicing engineers interested in understanding the behavior of heat and mass transfer and fluid flow during materials processing While it is designed primarily for materials engineering education it is a good reference for practicing materials engineers looking for insight into phenomena controlling their processes A solutions manual lecture slides and figure slides are available for qualifying adopting professors Transport Phenomena in Materials Processing and Manufacturing ,1992

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