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TRANSPORT PROCESSES AND SEPARATION PROCESS PRINCIPLES

(INCLUDES UNIT OPERATIONS)

Prentice Hall Appropriate for one-year transport phenomena (also called transport processes) and separation processes course. First semester covers fluid mechanics, heat and mass transfer; second semester covers separation process principles (includes unit operations). The title of this Fourth Edition has been changed from Transport Processes and Unit Operations to Transport Processes and Separation Process Principles (Includes Unit Operations). This was done because the term Unit Operations has been largely superseded by the term Separation Processes which better reflects the present modern nomenclature being used. The main objectives and the format of the Fourth Edition remain the same. The sections on momentum transfer have been greatly expanded, especially in the sections on fluidized beds, flow meters, mixing, and non-Newtonian fluids. Material has been added to the chapter on mass transfer. The chapters on absorption, distillation, and liquid-liquid extraction have also been enlarged. More new material has been added to the sections on ion exchange and crystallization. The chapter on membrane separation processes has been greatly expanded especially for gas-membrane theory.

TRANSPORT PROCESSES AND SEPARATION PROCESS PRINCIPLES (INCLUDES UNIT OPERATIONS)

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TRANSPORT PROCESSES AND SEPARATION PROCESS PRINCIPLES

The Complete, Unified, Up-to-Date Guide to Transport and Separation-Fully Updated for Today's Methods and Software Tools Transport Processes and Separation Process Principles, Fifth Edition, offers a unified and up-to-date treatment of momentum, heat, and mass transfer and separations processes. This edition-reorganized and modularized for better readability and to align with modern chemical engineering curricula-covers both fundamental principles and practical applications, and is a key resource for chemical engineering students and professionals alike. This edition provides New chapter objectives and summaries throughout Better linkages between coverage of heat and mass transfer More coverage of heat exchanger design New problems based on emerging topics such as biotechnology, nanotechnology, and green engineering New instructor resources: additional homework problems, exam questions, problem-solving videos, computational projects, and more Part 1 thoroughly covers the fundamental principles of transport phenomena, organized into three sections: fluid mechanics, heat transfer, and mass transfer. Part 2 focuses on key separation processes, including absorption, stripping, humidification, filtration, membrane separation, gaseous membranes, distillation, liquid-liquid extraction, adsorption, ion exchange, crystallization and particle-size reduction, settling, sedimentation, centrifugation, leaching, evaporation, and drying. The authors conclude with convenient appendices on the properties of water, compounds, foods, biological materials, pipes, tubes, and screens. The companion website (trine.edu/transport5ed/) contains additional homework problems that incorporate today's leading software, including Aspen/CHEMCAD, MATLAB, COMSOL, and Microsoft Excel.

TRANSPORT PHENOMENA (2ND ED.)

John Wiley & Sons Market_Desc: · Chemical, Mechanical, Nuclear, Industrial Engineers Special Features: · Careful attention is paid to the presentation of the basic theory· Enhanced sections throughout text provide much firmer foundation than the first edition· Literature citations are given throughout for reference to additional material About The Book: The long-awaited revision of a classic! This new edition presents a balanced introduction to transport phenomena, which is the foundation of its long-standing success. Topics include mass transport, momentum transport and energy transport, which are presented at three different scales: molecular, microscopic and macroscopic.

TRANSPORT PROCESSES AND UNIT OPERATIONS

BASIC EQUATIONS OF THE MASS TRANSPORT THROUGH A MEMBRANE LAYER

Elsevier With a detailed analysis of the mass transport through membrane layers and its effect on different separation processes, this book provides a comprehensive look at the theoretical and practical aspects of membrane transport properties and functions. Basic equations for every membrane are provided to predict the mass transfer rate, the concentration distribution, the convective velocity, the separation efficiency, and the effect of chemical or biochemical reaction taking into account the heterogeneity of the membrane layer to help better understand the mechanisms of the separation processes. The reader will be able to describe membrane separation processes and the membrane reactors as well as choose the most suitable membrane structure for separation and for membrane reactor. Containing detailed discussion of the latest results in transport processes and separation processes, this book is essential for chemistry students and practitioners of chemical engineering and process engineering. Detailed survey of the theoretical and practical aspects of every membrane process with specific equations Practical examples discussed in detail with clear steps Will assist in planning and preparation of more efficient membrane structure separation

ELECTRONIC WASTE

RECYCLING TECHNIQUES

Springer This book presents an overview of the characterization of electronic waste. In addition, processing techniques for the recovery of metals, polymers and ceramics are described. This book serves as a source of information and as an educational technical reference for practicing scientists and engineers, as well as for students.

TRANSPORT PHENOMENA FUNDAMENTALS

CRC Press This volume is organized to highlight the parallels and the differences between the transport phenomena. It facilitates comprehension and retention of basic momentum, heat, mass and charge transport processes and properties and features a balance equation format based on systematic addition and analysis of each term in the balance equation. There are more than 1300 equations, and end-of-chapter problems are provided to reinforce important text material.

ADVANCED PHYSICOCHEMICAL TREATMENT PROCESSES

Springer Science & Business Media The past thirty years have witnessed a growing worldwide desire that positive actions be taken to restore and protect the environment from the degrading effects of all forms of pollution—air, water, soil, and noise. Because pollution is a direct or indirect consequence of waste, the seemingly idealistic demand for “zero discharge” can be construed as an unrealistic demand for zero waste. However, as long as waste continues to exist, we can only attempt to abate the subsequent pollution by converting it to a less noxious form. Three major questions usually arise when a particular type of pollution has been identified: (1) How serious is the pollution? (2) Is the technology to abate it available? and (3) Do the costs of abatement justify the degree of abatement achieved? This book is one of the volumes of the Handbook of Environmental Engineering series. The principal intention of this series is to help readers formulate answers to the last two questions above. The traditional approach of applying tried-and-true solutions to specific pollution problems has been a major contributing factor to the success of environmental engineering, and has accounted in large measure for the establishment of a “methodology of pollution control.” However, the realization of the ever-increasing complexity and interrelated nature of current environmental problems renders it imperative that intelligent planning of pollution abatement systems be undertaken.

MASS TRANSFER

ADVANCEMENT IN PROCESS MODELLING

BoD – Books on Demand This book covers a wide variety of topics related to advancements in different stages of mass transfer modelling processes. Its purpose is to create a platform for the exchange of recent observations, experiences, and achievements. It is recommended for those in the chemical, biotechnological, pharmaceutical, and nanotechnology industries as well as for students of natural sciences, technical, environmental and employees in companies which manufacture machines for the above-mentioned industries. This work can also be a useful source for researchers and engineers dealing with mass transfer and related issues.

HANDBOOK OF INDUSTRIAL DRYING, FOURTH EDITION

CRC Press By far the most commonly encountered and energy-intensive unit operation in almost all industrial sectors, industrial drying continues to attract the interest of scientists, researchers, and engineers. The Handbook of Industrial Drying, Fourth Edition not only delivers a comprehensive treatment of the current state of the art, but also serves as a consultative reference for streamlining industrial drying operations. New to the Fourth Edition: Computational fluid dynamic simulation Solar, impingement, and pulse combustion drying Drying of fruits, vegetables, sugar, biomass, and coal Physicochemical aspects of sludge drying Life-cycle assessment of drying systems Covering commonly encountered dryers as well as innovative dryers with future potential, the Handbook of Industrial Drying, Fourth Edition not only details the latest developments in the field, but also explains how improvements in dryer design and operation can increase energy efficiency and cost-effectiveness.

MATHEMATICAL AND PHYSICAL MODELING OF MATERIALS PROCESSING OPERATIONS

CRC Press The past few decades have brought significant advances in the computational methods and in the experimental techniques used to study transport phenomena in materials processing operations. However, the advances have been made independently and with competition between the two approaches. Mathematical models are easier and less costly to implement, but experiments are

essential for verifying theoretical models. In *Mathematical and Physical Modeling of Materials Processing Operations*, the authors bridge the gap between mathematical modelers and experimentalists. They combine mathematical and physical modeling principles for materials processing operations simulation and use numerous examples to compare theoretical and experimental results. The modeling of transport processes is multi-disciplinary, involving concepts and principles not all of which can be associated with just one field of study. Therefore, the authors have taken care to ensure that the text is self-sustaining through the variety and breadth of topics covered. Beyond the usual topics associated with transport phenomena, the authors also include detailed discussion of numerical methods and implementation of process models, software and hardware selection and application, and representation of auxiliary relationships, including turbulence modeling, chemical kinetics, magnetohydrodynamics, and multi-phase flow. They also provide several correlations for representing the boundary conditions of fluid flow, heat transfer, and mass transfer phenomena. *Mathematical and Physical Modeling of Materials Processing Operations* is ideal for introducing these tools to materials engineers and researchers. Although the book emphasizes materials, some of the topics will prove interesting and useful to researchers in other fields of chemical and mechanical engineering.

ENGINEERING PROPERTIES OF FOODS, FOURTH EDITION

CRC Press It has been nearly a decade since the third edition of *Engineering Properties of Foods* was published, and food structure/microstructure remains a subject of research interest. In fact, significant developments have taken place in the area of high pressure processing (HPP), which has been approved for pasteurization of food by the Food and Drug Administration. Kinetic data related to HPP have proven important for validation of pressure-assisted pasteurization. Due to these developments, three new chapters have been added to the Fourth Edition: *Food Microstructure Analysis Glass Transition in Foods Kinetics and Process Design for High-Pressure Processing*. The text focuses on elucidating the engineering aspects of food properties and their variations, supplemented by representative data. Chapters have been updated and revised to include recent developments. The book presents data on physical, chemical, and biological properties, illustrating their relevance and practical importance. The topics range from surface properties, rheological properties, and thermal properties to thermodynamic, dielectric, and gas exchange properties. The chapters follow a consistent format for ease of use. Each chapter contains an introduction, food property definition, measurement procedure, modeling, representative data compilation, and applications.

BIOLOGICAL AND BIOENVIRONMENTAL HEAT AND MASS TRANSFER

CRC Press Providing a foundation in heat and mass transport, this book covers engineering principles of heat and mass transfer. The author discusses biological content, context, and parameter regimes and supplies practical applications for biological and biomedical engineering, industrial food processing, environmental control, and waste management. The book contains end-of-chapter problems and sections highlighting key concepts and important terminology. It offers cross-references for easy access to related areas and relevant formulas, as well as detailed examples of transport phenomena, and descriptions of physical processes. It covers mechanisms of diffusion, capillarity, convection, and dispersion.

PROCESS EQUIPMENT AND PLANT DESIGN

PRINCIPLES AND PRACTICES

Elsevier *Process Equipment and Plant Design: Principles and Practices* takes a holistic approach towards process design in the chemical engineering industry, dealing with the design of individual process equipment and its configuration as a complete functional system. Chapters cover typical heat and mass transfer systems and equipment included in a chemical engineering curriculum, such as heat exchangers, heat exchanger networks, evaporators, distillation, absorption, adsorption, reactors and more. The authors expand on additional topics such as industrial cooling systems, extraction, and topics on process utilities, piping and hydraulics, including instrumentation and safety basics that supplement the equipment design procedure and help to arrive at a complete plant design. The chapters are arranged in sections pertaining to heat and mass transfer processes, reacting systems, plant hydraulics and process vessels, plant auxiliaries, and engineered safety as well as a separate chapter showcasing examples of process design in complete plants. This comprehensive reference bridges the gap between industry and academia, while exploring best practices in design, including relevant theories in process design making this a valuable primer for fresh graduates and professionals working on design projects in the industry. Serves as a consolidated resource for process and plant design, including process utilities and engineered safety. Bridges the gap between industry and academia by including practices in design and summarizing relevant theories. Presents design solutions as a complete functional system and not merely the design of major equipment. Provides design procedures as pseudo-code/flow-chart, along with practical considerations.

BIOPROCESS ENGINEERING PRINCIPLES

Academic Press This welcome new edition covers bioprocess engineering principles for the reader with a limited engineering background. It explains process analysis from an engineering point of view, using worked examples and problems that relate to biological systems. Application of engineering concepts is illustrated in areas of modern biotechnology such as recombinant protein production, bioremediation, biofuels, drug development, and tissue engineering, as well as microbial fermentation. The main sub-disciplines within the engineering curriculum are all covered; *Material and Energy Balances, Transport Processes, Reactions and Reactor Engineering*. With new and expanded material, Doran's textbook remains the book of choice for students seeking to move into bioprocess engineering. **NEW TO THIS EDITION:** All chapters thoroughly revised for current developments, with over 200 pgs of new material, including significant new content in: *Metabolic Engineering Sustainable Bioprocessing Membrane Filtration Turbulence and Impeller Design Downstream Processing Oxygen Transfer Systems*. Over 150 new problems and worked examples. More than 100 new illustrations. **New to this edition:** All chapters thoroughly revised for current developments, with over 200 pgs of new material, including significant new content in: *Metabolic Engineering Sustainable Bioprocessing Membrane Filtration Turbulence and Impeller*

Design Downstream Processing Oxygen Transfer Systems Over 150 new problems and worked examples More than 100 new illustrations

FOOD PROPERTIES HANDBOOK, SECOND EDITION

CRC Press Dramatically restructured, more than double in size, the second edition of the Food Properties Handbook has been expanded from seven to 24 chapters. In the more than ten years since the publication of the internationally acclaimed and bestselling first edition, many changes have taken place in the approaches used to solve problems in food preservation, processing, storage, marketing, consumption, and even after consumption. Incorporating changes too numerous to list, this updated edition provides new measurement techniques, basic data compiled for diversified food groups, worked-out examples, and detailed graphs and illustrations. Explores Empirical and Theoretical Prediction Models The book clearly defines the terminology and elucidates the theory behind the measurement techniques, including applications and limitations of each method. It includes data on sources of error in measurement techniques and experimental data from the literature in graphical or tabular form. The volume also elucidates empirical and theoretical prediction models for different foods with processing conditions, descriptions of the applications of the properties, and coverage of where and how to use the data and models in food processing. User-Friendly Format Puts the Latest Information within Easy Reach Still under the aegis of Shafiq Rahman, the new edition is now an edited volume, benefitting from the input and expertise of numerous contributors spanning both the globe and the many disciplines that influence the field. Presented in a user-friendly format, the second edition remains the definitive, and arguably the only, source for data on physical, thermal, thermodynamic, structural, and acoustic properties of foods.

THE PRINCIPLES OF THERMAL SCIENCES AND THEIR APPLICATION TO ENGINEERING

CRC Press Energy efficiency-a top priority across the range of engineering disciplines-requires a thorough understanding and careful application of thermophysical heat transfer. Although closely related, most texts tend to treat thermodynamics and heat transfer separately. The Principles of Thermal Science and Their Application to Engineering unifies the two topics in a unique approach that offers readers a strong, practical background in thermal science. The author covers virtually the entire field in a single, easy-to-read book. Beginning with classical thermodynamics, the chapters discuss the First, Second, and Third Laws of Thermodynamics, engine cycles, and other topics. The focus then shifts to heat transfer, with a thorough examination of conduction and convection and exploring various aspects radiation heat transfer. Finally, the text offers a clear, concise introduction to statistical thermodynamics. Numerous worked examples complement the text and offer readers a glimpse into problems often encountered in practice, in areas ranging from typical heat transfer problems to simulation of energy problems, and including questions related to combustion and the environment. Ideal for both self-study and coursework, The Principles of Thermal Science and Their Application to Engineering helps build the foundation needed by engineers in all disciplines, and will prove itself particularly valuable for chemical engineers, fuel technologists, and fire scientists.

FREE-RADICAL RETROGRADE-PRECIPITATION POLYMERIZATION (FRRPP)

NOVEL CONCEPT, PROCESSES, MATERIALS, AND ENERGY ASPECTS

Springer Science & Business Media Providing insight on the free-radical retrograde-precipitation polymerization process, this volume examines the phenomenological aspects in comparison to other materials, such as nanoscale confinement behavior and nucleated hot spots.

THE CRC HANDBOOK OF MECHANICAL ENGINEERING, SECOND EDITION

CRC Press Since the first edition of this comprehensive handbook was published ten years ago, many changes have taken place in engineering and related technologies. Now, this best-selling reference has been updated for the 21st century, providing complete coverage of classic engineering issues as well as groundbreaking new subject areas. The second edition of The CRC Handbook of Mechanical Engineering covers every important aspect of the subject in a single volume. It continues the mission of the first edition in providing the practicing engineer in industry, government, and academia with relevant background and up-to-date information on the most important topics of modern mechanical engineering. Coverage of traditional topics has been updated, including sections on thermodynamics, solid and fluid mechanics, heat and mass transfer, materials, controls, energy conversion, manufacturing and design, robotics, environmental engineering, economics and project management, patent law, and transportation. Updates to these sections include new references and information on computer technology related to the topics. This edition also includes coverage of new topics such as nanotechnology, MEMS, electronic packaging, global climate change, electric and hybrid vehicles, and bioengineering.

MODELING AND SIMULATION OF CHEMICAL PROCESS SYSTEMS

CRC Press In this textbook, the author teaches readers how to model and simulate a unit process operation through developing mathematical model equations, solving model equations manually, and comparing results with those simulated through software. It covers both lumped parameter systems and distributed parameter systems, as well as using MATLAB and Simulink to solve the system model equations for both. Simplified partial differential equations are solved using COMSOL, an effective tool to solve PDE, using the fine element method. This book includes end of chapter problems and worked examples, and summarizes reader goals at the beginning of each chapter.

CHITOSAN BASED MATERIALS AND ITS APPLICATIONS

Bentham Science Publishers This volume presents 10 reviews contributed by eminent researchers around the world on chitosan based materials. The introductory chapters present information on general characteristics of chitosan and various types of materials which

are based on it such as nanofibers, nanoparticles, nanocapsules and other chemically modified chitosans. This is followed by an explanation of chitosan characterization and extraction techniques. Concluding chapters describe the applications of chitosan products in water treatment, drug delivery, edible films and pervaporation membranes. Readers will therefore gain an understanding about chitosan and materials derived from this polymer and their practical applications. The volume serves as a simple reference for chemical engineering students and professionals interested in the basic and applied chemistry of chitosan and chitosan-derived products.

NONEQUILIBRIUM THERMODYNAMICS

TRANSPORT AND RATE PROCESSES IN PHYSICAL, CHEMICAL AND BIOLOGICAL SYSTEMS

Elsevier Nonequilibrium Thermodynamics: Transport and Rate Processes in Physical, Chemical and Biological Systems, Fourth Edition emphasizes the unifying role of thermodynamics in analyzing natural phenomena. This updated edition expands on the third edition by focusing on the general balance equations for coupled processes of physical, chemical and biological systems. Updates include stochastic approaches, self-organization criticality, ecosystems, mesoscopic thermodynamics, constructal law, quantum thermodynamics, fluctuation theory, information theory, and modeling the coupled biochemical systems. The book also emphasizes nonequilibrium thermodynamics tools, such as fluctuation theories, mesoscopic thermodynamic analysis, information theories, and quantum thermodynamics in describing and designing small scale systems. Provides a useful text for seniors and graduate students from diverse engineering and science programs Highlights the fundamentals of equilibrium thermodynamics, transport processes and chemical reactions Expands the theory of nonequilibrium thermodynamics and its use in coupled transport processes and chemical reactions in physical, chemical and biological systems Presents a unified analysis for transport and rate processes in various time and space scales Discusses stochastic approaches in thermodynamic analysis, including fluctuation and information theories, mesoscopic nonequilibrium thermodynamics, constructal law and quantum thermodynamics

TRANSPORT PROCESSES

MOMENTUM, HEAT, AND MASS

Allyn & Bacon Good, No Highlights, No Markup, all pages are intact, Slight Shelfwear, may have the corners slightly dented, may have slight color changes/slightly damaged spine.

FOOD DRYING SCIENCE AND TECHNOLOGY

MICROBIOLOGY, CHEMISTRY, APPLICATIONS

DEStech Publications, Inc A guide to the major food drying techniques and equipment. It features technologies for meats, fruits, vegetables, and seafood. It covers microbial issues and safety. It includes designs for drying systems and manufacturing lines, and information on microbial safety, preservation, and packaging.

SEPARATION OF MOLECULES, MACROMOLECULES AND PARTICLES

PRINCIPLES, PHENOMENA AND PROCESSES

Cambridge University Press A modern separation process textbook written for advanced undergraduate and graduate level courses in chemical engineering.

HANDBOOK OF FOOD PROCESS DESIGN, 2 VOLUME SET

John Wiley & Sons In the 21st Century, processing food is no longer a simple or straightforward matter. Ongoing advances in manufacturing have placed new demands on the design and methodology of food processes. A highly interdisciplinary science, food process design draws upon the principles of chemical and mechanical engineering, microbiology, chemistry, nutrition and economics, and is of central importance to the food industry. Process design is the core of food engineering, and is concerned at its root with taking new concepts in food design and developing them through production and eventual consumption. Handbook of Food Process Design is a major new 2-volume work aimed at food engineers and the wider food industry. Comprising 46 original chapters written by a host of leading international food scientists, engineers, academics and systems specialists, the book has been developed to be the most comprehensive guide to food process design ever published. Starting from first principles, the book provides a complete account of food process designs, including heating and cooling, pasteurization, sterilization, refrigeration, drying, crystallization, extrusion, and separation. Mechanical operations including mixing, agitation, size reduction, extraction and leaching processes are fully documented. Novel process designs such as irradiation, high-pressure processing, ultrasound, ohmic heating and pulsed UV-light are also presented. Food packaging processes are considered, and chapters on food quality, safety and commercial imperatives portray the role process design in the broader context of food production and consumption.

GREEN ENGINEERING FOR CAMPUS SUSTAINABILITY

Springer This book highlights current efforts and research into achieving campus sustainability. The book start with Introduction followed by two chapters discusses best governance and practices in enhancing campus sustainability, while subsequent chapters elaborate on green building and bioenergy. In addition, the book discusses several initiatives regarding campus waste management including sewage recycling potential.

HANDBOOK OF FOOD PROCESS DESIGN

John Wiley & Sons "This book will offer a comprehensive account of the design of all major food processing systems, including both established and novel unit operations. The range of equipment available for any given process will be described, including the basic theoretical principles and modes of operation. Advantages and limitations of the equipment within various relevant parameters (such as size, processing time, cost and energy requirements) will be explained and schematic diagrams will be provided to show the stages of each process component in detail. The book also covers computer-aided design and control systems, cost considerations and cleaning and sanitation methods. Practical examples of process design scenarios will be included to help the reader in specifying and designing their own operations. All chapters will follow the following format: 1. Purpose of unit operation 2. What are the end products of the process? 3. Process flow sheet, material and energy balances, and schematic diagram of the process and its components 4. Basic theoretical principles and mode of operations 5. Different types of equipment available with their advantages and limitations. What are the parameters we need to know? For example, time, energy, size, and other factors 6. Empirical data and rules of thumb used to facilitate the various design calculations, simplified equations and shortcut methods 7. Simple equations, tables, and graphs to estimate the design parameters 8. Process control, operations and maintenance of the unit operations 9. Advanced levels of process design for complicated systems. Computer aided process/plant design 10. Cleaning and sanitation methods 11. Capital and operating cost for different size of the equipments 12. Summary and future needs 13. Worked out examples related to design"--

PRINCIPLES OF MASS TRANSFER AND SEPERATION PROCESSES

PHI Learning Pvt. Ltd. This textbook is targetted to undergraduate students in chemical engineering, chemical technology, and biochemical engineering for courses in mass transfer, separation processes, transport processes, and unit operations. The principles of mass transfer, both diffusional and convective have been comprehensively discussed. The application of these principles to separation processes is explained. The more common separation processes used in the chemical industries are individually described in separate chapters. The book also provides a good understanding of the construction, the operating principles, and the selection criteria of separation equipment. Recent developments in equipment have been included as far as possible. The procedure of equipment design and sizing has been illustrated by simple examples. An overview of different applications and aspects of membrane separation has also been provided. 'Humidification and water cooling', necessary in every process indus-try, is also described. Finally, elementary principles of 'unsteady state diffusion' and mass transfer accompanied by a chemical reaction are covered. **SALIENT FEATURES :** • A balanced coverage of theoretical principles and applications. • Important recent developments in mass transfer equipment and practice are included. • A large number of solved problems of varying levels of complexities showing the applications of the theory are included. • Many end-chapter exercises. • Chapter-wise multiple choice questions. • An Instructors manual for the teachers.

FUNDAMENTALS OF FOOD PROCESS ENGINEERING

Springer Written for the upper level undergraduate, this updated book is also a solid reference for the graduate food engineering student and professional. This edition features the addition of sections on freezing, pumps, the use of chemical reaction kinetic date for thermal process optimization, and vacuum belt drying. New sections on accurate temperature measurements, microbiological inactivation curves, inactivation of microorganisms and enzymes, pasteurization, and entrainment are included, as are non-linear curve fitting and processes dependent on fluid film thickness. Other sections have been expanded.

UNIT OPERATIONS OF PARTICULATE SOLIDS

THEORY AND PRACTICE

CRC Press Suitable for practicing engineers and engineers in training, this book covers the most important operations involving particulate solids. Through clear explanations of theoretical principles and practical laboratory exercises, the text provides an understanding of the behavior of powders and pulverized systems. It also helps readers develop skills for operating, optimizing, and innovating particle processing technologies and machinery in order to carry out industrial operations. The author explores common bulk solids processing operations, including milling, agglomeration, fluidization, mixing, and solid-fluid separation.

TRANSPORT PROCESSES AND SEPARATION PROCESS PRINCIPLES

Prentice Hall The Complete, Unified, Up-to-Date Guide to Transport and Separation—Fully Updated for Today's Methods and Software Tools *Transport Processes and Separation Process Principles, Fifth Edition*, offers a unified and up-to-date treatment of momentum, heat, and mass transfer and separations processes. This edition—reorganized and modularized for better readability and to align with modern chemical engineering curricula—covers both fundamental principles and practical applications, and is a key resource for chemical engineering students and professionals alike. This edition provides New chapter objectives and summaries throughout Better linkages between coverage of heat and mass transfer More coverage of heat exchanger design New problems based on emerging topics such as biotechnology, nanotechnology, and green engineering New instructor resources: additional homework problems, exam questions, problem-solving videos, computational projects, and more Part 1 thoroughly covers the fundamental principles of transport phenomena, organized into three sections: fluid mechanics, heat transfer, and mass transfer. Part 2 focuses on key separation processes, including absorption, stripping, humidification, filtration, membrane separation, gaseous membranes, distillation, liquid—liquid extraction, adsorption, ion exchange, crystallization and particle-size reduction, settling, sedimentation, centrifugation, leaching, evaporation, and drying. The authors conclude with convenient appendices on the properties of water, compounds, foods, biological materials, pipes, tubes, and screens. The companion website (trine.edu/transport5ed/) contains additional homework problems that incorporate today's leading software, including Aspen/CHEMCAD, MATLAB, COMSOL, and Microsoft Excel.

TRANSPORT PROCESSES AND SEPARATION

TRANSPORT PROPERTIES OF POLYMERIC MEMBRANES

Elsevier Transport Properties of Polymeric Membranes is an edited collection of papers that covers, in depth, many of the recent technical research accomplishments in transport characteristics through polymers and their applications. Using the transport through polymer membranes method leads to high separation efficiency, low running costs, and simple operating procedures compared to conventional separation methods. This book provides grounding in fundamentals and applications to give you all the information you need on using this method. This book discusses the different types of polymer, their blends, composites, nanocomposites and their applications in the field of liquid, gas and vapor transport. Some topics of note include modern trends and applications of polymer nanocomposites in solvent, vapor and gas transport; fundamentals and measurement techniques for gas and vapor transport in polymers; and transport properties of hydrogels. This handpicked selection of topics, and the combined expertise of contributors from global industry, academia, government and private research organizations, make this book an outstanding reference for anyone involved in the field of polymer membranes. Presents current trends in the field of transport of liquid, gas and vapor through various polymeric systems Features case studies focused on industrial applications of membrane technology, along with fundamentals of transport and materials Helps readers quickly look up a particular technique to learn key points, capabilities and drawbacks

MASS TRANSPORT PHENOMENA

Molecular mass transport phenomena in fluids -- Transport phenomena and the basic equations of change -- Molecular mass transport phenomena in liquids -- Mass transport phenomena in solids -- Unsteady-state diffusion -- Mass transfer coefficients in laminar and turbulent flow -- Interphase mass transport -- Continuous two-phase mass transport processes -- Mass transport in state processes -- Analog computer methods.

ENGINEERING PROPERTIES OF FOODS

CRC Press Ten years have passed since this reference's last edition - making Engineering Properties of Foods, Third Edition the must-have resource for those interested in food properties and their variations. Defined are food properties and the necessary theoretical background for each. Also evaluated is the usefulness of each property in the design and operation of important food processing equipment. Of particular importance is that this latest edition offers seven new chapters - many of which introduce information on groundbreaking new properties. These chapters, along with the inclusion of two revised chapters from previous editions, result in a text that offers nine out of sixteen chapters of new material. This long-awaited third edition concentrates on a clear, comprehensive explanation of properties and their variations supplemented by abundant, representative information. By providing data in such a succinct and cogent manner, this comprehensive reference allows you to fully immerse in its depth and breadth of scope, while fully holding interest in the text.

SEPARATION OF MOLECULES, MACROMOLECULES AND PARTICLES

PRINCIPLES, PHENOMENA AND PROCESSES

Cambridge University Press Providing chemical engineering undergraduate and graduate students with a basic understanding of how separation of a mixture of molecules, macromolecules or particles is achieved, this textbook is a comprehensive introduction to the engineering science of separation. • Students learn how to apply their knowledge to determine the separation achieved in a given device or process • Real-world examples are taken from biotechnology, chemical, food, petrochemical, pharmaceutical and pollution control industries • Worked examples, elementary separator designs and chapter-end problems are provided, giving students a practical understanding of separation. The textbook systematically develops different separation processes by considering the forces causing the separation and how this separation is influenced by the patterns of bulk flow in the separation device. Readers will be able to take this knowledge and apply it to their own future studies and research in separation and purification. Online resources include solutions to the exercises and guidance for computer simulations.

BASIC EQUATIONS OF MASS TRANSPORT THROUGH A MEMBRANE LAYER

Elsevier Basic Equations of Mass Transport Through a Membrane Layer, Second Edition, has been fully updated to deliver the latest research in the field. This volume covers the essentials of compound separation, product removal, concentration, and production in the chemical, biochemical, pharmaceutical, and food industries. It outlines the various membrane processes and their applications, offering a detailed mathematical description of mass transport and defining basic mass transport and concentration distribution expressions. Additionally, this book discusses the process parameters and application of the expressions developed for a variety of industrial applications. Comprehensive explanations of convective/diffusive mass transport are provided, both with and without polarization layers, that help predict and process performance and facilitate improvements to operation conditions and efficiency. Basic Equations of Mass Transport Through a Membrane Layer is an ideal resource for engineers and technologists in the chemical, biochemical, and pharmaceutical industries, as well as researchers, professors, and students in these areas at both an undergraduate and graduate level. Cites and analyzes mass transport equations developed for different membrane processes. Examines the effect of biochemical/chemical reactions in the presence of convective and diffusive flows in plane and cylindrical spaces. Defines the mass transfer rate for first- and zero-order reactions and analytical approaches are given for other-order reactions in closed mathematical forms. Analyzes the simultaneous convective and diffusive transports with same or different directions.

TRANSPORT PHENOMENA AND UNIT OPERATIONS

A COMBINED APPROACH

John Wiley & Sons The subject of transport phenomena has long been thoroughly and expertly addressed on the graduate and theoretical levels. Now *Transport Phenomena and Unit Operations: A Combined Approach* endeavors not only to introduce the fundamentals of the discipline to a broader, undergraduate-level audience but also to apply itself to the concerns of practicing engineers as they design, analyze, and construct industrial equipment. Richard Griskey's innovative text combines the often separated but intimately related disciplines of transport phenomena and unit operations into one cohesive treatment. While the latter was an academic precursor to the former, undergraduate students are often exposed to one at the expense of the other. *Transport Phenomena and Unit Operations* bridges the gap between theory and practice, with a focus on advancing the concept of the engineer as practitioner. Chapters in this comprehensive volume include: Transport Processes and Coefficients Frictional Flow in Conduits Free and Forced Convective Heat Transfer Heat Exchangers Mass Transfer; Molecular Diffusion Equilibrium Staged Operations Mechanical Separations Each chapter contains a set of comprehensive problem sets with real-world quantitative data, affording students the opportunity to test their knowledge in practical situations. *Transport Phenomena and Unit Operations* is an ideal text for undergraduate engineering students as well as for engineering professionals.