

Chemical Engineering Kinetics Smith J M Mcgraw Hill

Modern Methods in Kinetics

Comprehensive text provides sound understanding of the relevant factors in ion exchange and the theoretical tools needed to solve specific problems. Detailed coverage of ion exchangers, equilibria, kinetics, electrochemical properties, ion-exchanger membranes, much more. Each chapter contains helpful summary and references. Accessible to nonmathematical students. Introduction. 1962 edition.

Designed to give chemical engineers background for managing chemical reactions, this text examines the behavior of chemical reactions and reactors; conservation equations for reactors; heterogeneous reactions; fluid-fluid and fluid-solid reaction systems; heterogeneous catalysis and catalytic kinetics; diffusion and heterogeneous catalysis; and analyses and design of heterogeneous reactors. 1976 edition.

This massively updated and expanded fifth edition is the most complete, authoritative engineering treatment of the dehydration and gas purification processes used in industry today. Of great value to design and operations engineers, it gives practical process and equipment design descriptions, basic data, plant performance results, and other detailed information on gas purification processes and hardware. This latest edition incorporates all significant advances in the field since 1985. You will find major new chapters on the rapidly expanding technologies of nitrogen oxide control, with discussions of regulatory requirements and available processes; absorption in physical solvents, covering single component and mixed solvent systems; and membrane permeation, with emphasis on the gas purification applications of membrane units. In addition, new sections cover areas of strong current interest, particularly liquid hydrocarbon treating, Claus plant tail gas treating, thermal oxidation of volatile organic compounds, and sulfur scavenging processes. This volume brings you expanded coverage of alkanolamines for hydrogen sulfide and carbon dioxide removal, the removal and use of ammonia in gas purification, the use of alkaline salt solutions for acid gas removal, and the use of water to absorb gas impurities. The basic technologies and all significant advances in the following areas are thoroughly described: sulfur dioxide removal and recovery processes, processes for converting hydrogen sulfide to sulfur, liquid phase oxidation processes for hydrogen sulfide removal, the absorption of water vapor by dehydrating solutions, gas dehydration and purification by adsorption, and the catalytic and thermal conversion of gas impurities.

Chemical Engineering and Chemical Process Technology is a theme component of Encyclopedia of Chemical Sciences, Engineering and Technology Resources in the global Encyclopedia of Life Support Systems (EOLSS), which is an integrated compendium of twenty Encyclopedias. Chemical engineering is a branch of engineering, dealing with processes in which materials undergo changes in their physical or chemical state. These changes may concern size, energy content, composition and/or other application properties. Chemical engineering deals with many processes belonging to chemical industry or related industries (petrochemical, metallurgical, food, pharmaceutical, fine chemicals, coatings and colors, renewable raw materials, biotechnological, etc.), and finds application in manufacturing of such products as acids, alkalis, salts, fuels, fertilizers, crop protection agents, ceramics, glass, paper, colors, dyestuffs, plastics, cosmetics, vitamins and many others. It also plays significant role in environmental protection, biotechnology, nanotechnology, energy production and sustainable economical development. The Theme on Chemical Engineering and Chemical Process Technology deals, in five volumes and covers several topics such as: Fundamentals of Chemical Engineering; Unit Operations – Fluids; Unit Operations – Solids; Chemical Reaction Engineering; Process Development, Modeling, Optimization and Control; Process Management; The Future of Chemical Engineering; Chemical Engineering Education; Main Products, which are then expanded into multiple subtopics, each as a chapter. These five volumes are aimed at the following five major target audiences: University and College students Educators, Professional practitioners, Research personnel and Policy analysts, managers, and decision makers and NGOs.

This book determines adjustable parameters in mathematical models that describe steady state or dynamic systems, presenting the most important optimization methods used for parameter estimation. It focuses on the Gauss-Newton method and its modifications for systems and processes represented by algebraic or differential equation models.

Includes Part 1, Number 1 & 2: Books and Pamphlets, Including Serials and Contributions to Periodicals (January - December)

Ion-exchange Technology I: Theory and Materials describes the theoretical principles of ion-exchange processes. More specifically, this volume focuses on the synthesis, characterization, and modelling of ion-exchange materials and their associated kinetics and equilibria. This title is a highly valuable source not only to postgraduate students and researchers but also to industrial R&D specialists in chemistry, chemical, and biochemical technology as well as to engineers and industrialists.

"Interesting with many useful ideas and references. It covers a broad range and it is a good introduction to this field."

---Analyst

The continuous increase in human activities affects the environment in notable ways; these effects need to be monitored and controlled when appropriate to ensure the sustainability of our lives. Environmental pollution is one of the major problems associated with human activities as a result of routine and accidental releases. Currently, pollution prevention, control, and affected environment remediation receive great attention globally. This attention has led to a continuous increase in research efforts that aim to understand, simulate, and predict important processes that affect pollutant generation and migration. Optimization of chemical and physical reactions within different waste treatment technologies and remediation projects are the focus of many research projects worldwide. This book presents some kinetic models that could be used to support pollution prevention, control, and environmental assessments of human activities.

Clear evidence of increasing demands in the processing industry prompted the editors and authors to publish a new book about High Pressure Process Technology: Fundamentals and Applications. This book presents the latest knowledge regarding the high pressure processing aspects combined with that about the modeling, the design and the operation of safe and reliable high pressure plants and equipment. This treatment and selection of the subjects is stimulating and unique. Consisting of nine chapters, each subdivided into several sections, the book addresses the high pressure aspects, providing well selected correlated information connected with a comprehensive overview together with a large number of references. The main body of the first eight chapters refers to subjects like high pressure in general, the thermodynamics and kinetics of the fluids involved, the design of high pressure equipment, the modeling and design of reactors, separation and fractionation units, the safety aspects, the control and economics. In the extended last chapter, examples of promising high pressure applications are explained, such as chemical and enzymatic reactions in supercritical solvents, hydrogenation under supercritical conditions, supercritical water oxidation, polymerization with metallocene catalysts, supercritical extraction, fractionation and precipitation, supercritical pharma processing, ultra-high pressure sterilization and supercritical dry-cleaning.

Solutions Manual to Accompany Chemical Engineering Kinetics [by J.M. Smith], Second Edition
Chemical Engineering Kinetics McGraw-Hill (Canada) An Introduction to Chemical Engineering Kinetics & Reactor Design

Transport Phenomena A Unified Approach Brodkey Publishing

This long-awaited second edition of the successful introduction to the fundamentals of heterogeneous catalysis is now completely revised and updated. Written by internationally acclaimed experts, this textbook includes fundamentals of adsorption, characterizing catalysts and their surfaces, the significance of pore structure and surface area, solid-state and surface chemistry, poisoning, promotion, deactivation and selectivity of catalysts, as well as catalytic process engineering. A final section provides a number of examples and case histories. With its color and numerous graphics plus references to help readers to easily find further reading, this is a pivotal work for an understanding of the principles involved.

This collection of challenging and well-designed test problems arising in literature studies also contains a wide spectrum of applications, including pooling/blending operations, heat exchanger network synthesis, homogeneous azeotropic separation, and dynamic optimization and optimal control problems.

Gas Separation by Adsorption Processes is a complete treatise on all aspects of adsorptive processes. It covers all fundamental principles as well as process design and simulation of gas adsorption processes for separation and purification. This highly popular book in the field has now been reprinted and made available in paperback form.

Rather than simply describing the processes and reactions involved in metal extraction, this book concentrates on fundamental principles to give readers an understanding of the possibilities for future developments in this field. It includes a review of the basics of thermodynamics, kinetics and engineering principles that have special importance for extractive metallurgy, to ensure that readers have the background necessary for maximum achievement. The various metallurgical unit processes (such as roasting, reduction, smelting and electrolysis) are illustrated by existing techniques for the extraction of the most common metals. Each chapter includes a bibliography of recommended reading, to aid in further study. The appendices include tables and graphs of thermodynamic qualities for most substances of metallurgical importance; these are ideal for calculating heat (enthalpy) balances and chemical equilibrium constants. SI Units are used consistently throughout the text.

Advances in Chemical Engineering

The vast majority of important applications in science, engineering and applied science are characterized by the existence of multiple minima and maxima, as well as first, second and higher order saddle points. The area of Deterministic Global Optimization introduces theoretical, algorithmic and computational advances that (i) address the computation and characterization of global minima and maxima, (ii) determine valid lower and upper bounds on the global minima and maxima, and (iii) address the enclosure of all solutions of nonlinear constrained systems of equations. Global optimization applications are widespread in all disciplines and they range from atomistic or molecular level to process and product level representations. The primary goal of this book is three fold : first, to introduce the reader to the basics of deterministic global optimization; second, to present important theoretical and algorithmic advances for several classes of mathematical problems that include biconvex and bilinear; problems, signomial problems, general twice differentiable nonlinear problems, mixed integer nonlinear problems, and the enclosure of all solutions of nonlinear constrained systems of equations; and third, to tie the theory and methods together with a variety of important applications.

Safety in the process industries is critical for those who work with chemicals and hazardous substances or processes. The field of loss prevention is, and continues to be, of supreme importance to countless companies, municipalities and governments around the world, and Lees' is a detailed reference to defending against hazards. Recognized as the standard work for chemical and process engineering safety professionals, it provides the most complete collection of information on the theory, practice, design elements, equipment, regulations and laws covering the field of process safety. An entire library of alternative books (and cross-referencing systems) would be needed to replace or improve upon it, but everything of importance to safety professionals, engineers and managers can be found in this all-encompassing three volume reference instead. The process safety encyclopedia, trusted worldwide for over 30 years Now available in print and online, to aid searchability and portability Over 3,600 print pages cover the full scope of process safety and loss prevention, compiling theory, practice, standards, legislation, case studies and lessons learned in one resource as opposed to multiple sources

Water-based techniques are widely used in minerals processing to separate valuable minerals and ore from less desirable materials. This comprehensive technical reference provides an overview of aqueous metallurgy and its applications in mineral processing operations. The text presents the physicochemical principles of various water-based processes. Written as a text for college- and graduate-level instruction, the book presents the fundamental principles of water-based metallurgy. The author has taught these topics at the college level for more than 30 years, and this book summarizes his lecture notes and vast experience in mineral processing science. It is a valuable reference for those studying mineral processing, resource recovery, and the corrosion of metals and alloys. In addition, it's a practical reference for environmental and chemical engineers, chemists, and mineral processing engineers who are responsible for mineral processing plant design and operations. To enhance learning and provide practical experience, each chapter closes with a series of homework problems based on the various concepts presented. Solutions to the problems, including full explanations, are provided at the back of the book.

The classic reference, now expanded and updated Chemical Reactor Design, Optimization, and Scaleup is the authoritative sourcebook on chemical reactors. This new Second Edition consolidates the latest information on current optimization and scaleup methodologies, numerical methods, and biochemical and polymer reactions. It provides the comprehensive tools and information to help readers design and specify chemical reactors confidently, with state-of-the-art skills. This authoritative guide: Covers the fundamentals and principles of chemical reactor design, along with advanced topics and applications Presents techniques for dealing with varying physical properties in reactors of all types and purposes Includes a completely new chapter on meso-, micro-, and nano-scale reactors that addresses such topics as axial diffusion in micro-scale reactors and self-assembly of nano-scale structures Explains the method of false transients, a numerical solution technique Includes suggestions for further reading, problems, and, when appropriate, scaleup or scaledown considerations at the end of each chapter to illustrate industrial applications Serves as a ready reference for explained formulas, principles, and data This is the definitive hands-on reference for practicing professionals and an excellent textbook for courses in chemical reactor design. It is an essential resource for chemical engineers in the process industries, including petrochemicals, biochemicals, microelectronics, and water treatment.

Presents comprehensive coverage of the subject of thermodynamics from a chemical engineering viewpoint. This text provides an exposition of the principles of thermodynamics and details their application to chemical processes. It contains problems, examples, and illustrations to help students understand complex concepts.

Enables chemical engineering students to bridge theory and practice Integrating scientific principles with practical engineering experience, this text enables readers to master the fundamentals of chemical processing and apply their knowledge of such topics as material and energy balances, transport phenomena, reactor design, and separations across

a broad range of chemical industries. The author skillfully guides readers step by step through the execution of both chemical process analysis and equipment design. Principles of Chemical Engineering Practice is divided into two sections: the Macroscopic View and the Microscopic View. The Macroscopic View examines equipment design and behavior from the vantage point of inlet and outlet conditions. The Microscopic View is focused on the equipment interior resulting from conditions prevailing at the equipment boundaries. As readers progress through the text, they'll learn to master such chemical engineering operations and equipment as: Separators to divide a mixture into parts with desirable concentrations Reactors to produce chemicals with needed properties Pressure changers to create favorable equilibrium and rate conditions Temperature changers and heat exchangers to regulate and change the temperature of process streams Throughout the book, the author sets forth examples that refer to a detailed simulation of a process for the manufacture of acrylic acid that provides a unifying thread for equipment sizing in context. The manufacture of hexyl glucoside provides a thread for process design and synthesis. Presenting basic thermodynamics, Principles of Chemical Engineering Practice enables students in chemical engineering and related disciplines to master and apply the fundamentals and to proceed to more advanced studies in chemical engineering.

This book covers topics of equilibria and kinetics of adsorption in porous media. Fundamental equilibria and kinetics are dealt with for homogeneous as well as heterogeneous particles. Five chapters of the book deal with equilibria and eight chapters deal with kinetics. Single component as well as multicomponent systems are discussed. In kinetics analysis, we deal with the various mass transport processes and their interactions inside a porous particle. Conventional approaches as well as the new approach using Maxwell-Stefan equations are presented. Various methods to measure diffusivity, such as the Differential Adsorption Bed (DAB), the time lag, the diffusion cell, chromatography, and the batch adsorber methods are also covered by the book. It can be used by lecturers and engineers who wish to carry out research in adsorption. A number of programming codes written in MatLab language are included so that readers can use them directly to better understand the behavior of single and multicomponent adsorption systems.

In this book, the reader is guided through the complex study of dynamic chemical engineering systems by the unique combination of a simplified presentation of the fundamental theory (Part 1) and direct hands-on computer experimentation with the provision of 85 accompanying computer-based simulation examples (Part 2) supplied on diskette. The ISIM digital simulation language is very simple to use and its powerful interactive nature enables the readers to create their own simulations, based on their own specific problems. This powerful dynamic ISIM software is ready to run on any DOS personal computer. The treatment employed in this book is well tried and tested, based on over 20 years experience in teaching an international post- experience course. Whether for the teacher, the student, the chemist or engineer, this book serves as the key to a greater understanding of chemical engineering dynamics through the fun and enjoyment of active learning.

The role of the chemical reactor is crucial for the industrial conversion of raw materials into products and numerous factors must be considered when selecting an appropriate and efficient chemical reactor. Chemical Reaction Engineering and Reactor Technology defines the qualitative aspects that affect the selection of an industrial chemical reactor and couples various reactor models to case-specific kinetic expressions for chemical processes. Offering a systematic development of the chemical reaction engineering concept, this volume explores: Essential stoichiometric, kinetic, and thermodynamic terms needed in the analysis of chemical reactors Homogeneous and heterogeneous reactors Residence time distributions and non-ideal flow conditions in industrial reactors Solutions of algebraic and ordinary differential equation systems Gas- and liquid-phase diffusion coefficients and gas-film coefficients Correlations for gas-liquid systems Solubilities of gases in liquids Guidelines for laboratory reactors and the estimation of kinetic parameters The authors pay special attention to the exact formulations and derivations of mass energy balances and their numerical solutions. Richly illustrated and containing exercises and solutions covering a number of processes, from oil refining to the development of specialty and fine chemicals, the text provides a clear understanding of chemical reactor analysis and design.

Chemical Reaction Engineering: Essentials, Exercises and Examples presents the essentials of kinetics, reactor design and chemical reaction engineering for undergraduate students. Concise and didactic in its approach, it features over 70 resolved examples and many exercises. The work is organized in two parts: in the first part kinetics is presented The publication of the third edition of "Chemical Engineering Volume" marks the completion of the re-orientation of the basic material contained in the first three volumes of the series. Volume 3 is devoted to reaction engineering (both chemical and biochemical), together with measurement and process control. This text is designed for students, graduate and postgraduate, of chemical engineering.

Providing a concise treatment of methods of heterogeneous catalysis used in the laboratory, this book describes the basic phenomena of heterogeneous catalytic reaction systems and discusses in detail the experimental methods and procedures for investigating these systems. The introductory chapter illustrates the whole procedure with an actual example. The next chapter presents the basic phenomena of catalytic systems and the concepts used in studying them. The third chapter covers the description of methods for investigating reaction mechanisms and the dynamics of heterogeneous catalytic reaction systems. The last chapter discusses the design and operation modes of laboratory reactors, frequently used for the investigation of heterogeneous catalytic reactions. The approach is interdisciplinary, providing a balance between chemical engineering and chemical viewpoints of treating laboratory-scale reactors. Chemists and chemical engineers involved in catalyst research will be very interested in this book and it can also be usefully used in specialized courses for graduate students in chemistry or in chemical reaction engineering.

Surveys the selection, design, and operation of most of the industrially important separation processes. Discusses the underlying principles on which the processes are based, and provides illustrative examples of the use of the processes in

a modern context. Features thorough treatment of newer separation processes based on membranes, adsorption, chromatography, ion exchange, and chemical complexation. Includes a review of historically important separation processes such as distillation, absorption, extraction, leaching, and crystallization and considers these techniques in light of recent developments affecting them.

Mathematical modelling of gas-solid catalytic reactors in industry is still limited. By consolidating progress in the understanding of catalytic processes, this book applies fundamental advances to the development of models for design, simulation and optimization of industrial reactors.

Describes how to conduct kinetic experiments with heterogeneous catalysts, analyze and model the results, and characterize the catalysts Detailed analysis of mass transfer in liquid phase reactions involving porous catalysts. Important to the fine chemicals and pharmaceutical industries so it has appeal to many researchers in both industry and academia (chemical engineering and chemistry departments)

The development and implementation of a new chemical process involves much more than chemistry, materials, and equipment. It is a very complex endeavor and its success depends on the effective interactions and organization of professionals in many different positions - scientists, chemical engineers, managers, attorneys, economists, and specialists. Developing An Industrial Chemical Process: An Integrated Approach is the first professional reference to examine the actual process development practices of industrial corporations, research organizations, engineering companies and universities. Backed by 45 years of experience within R&D, design, and management positions in various countries, the author presents his know-how for better and faster results and fewer start-up problems. While most books on chemical processes concentrate only on the scientific/technical aspect, this book also deals with the range of people and "real life" issues involved. Developing An Industrial Chemical Process serves as a "how to" guide for the effective management of process development procedures. The issues start with the "why" and "how" concerns of the executives and project managers and proceed with the actual implementation by professionals, each in his/her particular role. The author addresses the working organization and the different activities involved in a process development program, including the implementation, design, construction and start-up of a new plant. Finally, each chapter provides a short summary of the key issues along with suggestions for further reading. This book can help you handle the problems normally associated with the development and implementation of a new process and reduce the time and resources that you and your organization spend on this critical activity.

Includes abstracts of Kagaku k?gaku, v. 31-

This book teaches the basic equations of transport phenomena in a unified manner and uses the analogy between heat transfer and mass and momentum to explain the more difficult concepts. Part I covers the basic concepts in transport phenomena. Part II covers applications in greater detail. Part III deals with the transport properties. The three transport phenomena-heat, mass, and momentum transfer-are treated in depth through simultaneous (or parallel) developments. Transport properties such as viscosity, thermal conductivity, and mass diffusion coefficient are introduced in a simple manner early on and then applied throughout the rest of the book. Advanced discussion is provided separately. An entire chapter is devoted to the crucial material of non-Newtonian phenomena. This book covers heat transfer as it pertains to transport phenomena, and covers mass transfer as it relates to the analogy with heat and momentum. The book includes a complete treatment of fluid mechanics for Ch. E's. The treatment begins with Newton's law and including laminar flow, turbulent flow, fluid statics, boundary layers, flow past immersed bodies, and basic and advanced design in pipes, heat exchangers, and agitation vessels. This text is the only one to cover modern agitation design and scale-up thoroughly. The chapter on turbulence covers not only traditional approaches but also includes the most contemporary concepts of the transition and of coherent structures in turbulence. The book includes an extensive treatment of fluidization.

Computer programs and numerical methods are integrated throughout the text, especially in the example problems.

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