

Principles Of Adsorption And Reaction On Solid Surfaces

Adsorption processes have played a central role in water treatment for many years but their importance is on the rise with the continuous discoveries of new micropollutants in the water cycle (pharmaceuticals for example). In addition to the classical application in drinking water treatment, other application fields are attracting increasing interest, such as wastewater treatment, groundwater remediation, treatment of landfill leachate, and so on. Based on the author's long-term experience in adsorption research, the scientific monograph treats the theoretical fundamentals of adsorption technology for water treatment from a practical perspective. It presents all the basics needed for experimental adsorption studies as well as for process modelling and adsorber design. Topics discussed in the monograph include: introduction into basic concepts and practical applications of adsorption processes; adsorbents and their characterisation, single and multi-solute adsorption equilibria, adsorption kinetics, adsorption dynamics in fixed-bed adsorbers and fixed-bed adsorber design, regeneration and reactivation of adsorbents, introduction into geosorption processes in bank filtration and groundwater recharge. According to the increasing importance of micropollutants in the water cycle, particular attention is paid to their competitive adsorption in presence of background organic matter. Clear illustrations, extensive literature references and a useful index make this work indispensable for both scientists and technicians involved in water treatment. For many years, Bayliss's book remained the most important book of its kind. It is still valued for its historical information and its accurate bibliography.

Exciting results are still emerging from the many research groups working in this fertile area and the book is an excellent stimulus to researchers at the start of the 21st century."--BOOK JACKET.

Principles of Adsorption and Reaction on Solid Surfaces John Wiley & Sons

Catalysis

An Introduction to Chemical Kinetics

Foundations of Catalysis and Nanoscience

Decoding Complexity

Kinetics of Chemical Reactions

Pressure Swing Adsorption

Separation Process Principles with Applications Using Process Simulator, 4th Edition is the most comprehensive and up-to-date treatment of the major separation operations in the chemical industry. The 4th edition focuses on using process simulators to design separation processes and prepares readers for professional practice. Completely rewritten to enhance clarity, this fourth edition provides engineers with a strong understanding of the field. With the help of an additional co-author, the text presents new information on bioseparations throughout the chapters. A new chapter on mechanical separations covers settling, filtration and centrifugation including mechanical separations in biotechnology and cell lysis. Boxes help highlight fundamental equations. Numerous new examples and exercises are integrated throughout as well.

For nearly 30 years, Principles of Medical Biochemistry has integrated medical biochemistry with molecular genetics, cell biology, and genetics to provide complete yet concise coverage that links biochemistry with clinical medicine. The 4th Edition of this award-winning text by Drs. Gerhard Meisenberg and William H. Simmons has been fully updated with new clinical examples, expanded coverage of recent changes in the field, and many new case studies online. A highly visual format helps readers retain complex information, and USMLE-style questions (in print and online) assist with exam preparation. Just the right amount of detail on biochemistry, cell biology, and genetics - in one easy-to-digest textbook. Full-color illustrations and tables throughout help students master challenging concepts more easily. Online case studies serve as a self-assessment and review tool before exams. Online access includes nearly 150 USMLE-style questions in addition to the questions that are in the book. Glossary of technical terms. Clinical Boxes and Clinical Content demonstrate the integration of basic sciences and clinical applications, helping readers make connections between the two. New clinical examples have been added throughout the text.

Pressure Swing Adsorption is the first book that provides a coherent and concise summary of the underlying science and technology of pressure swing adsorption (PSA) processes at a level understandable to the practising engineer. PSA has achieved widespread commercial acceptance as the technology of choice for hydrogen purification, air separation and small scale air driers. However, PSA has numerous other actual and potential uses such as the recovery of methane from landfill gas, the production of carbon dioxide and other large scale applications. Since the design and optimization of a PSA process requires a somewhat mathematical model, two chapters of the book provide in-depth information on equilibrium theory and dynamic numerical simulation. However, this mathematical material will also help the general reader develop an understanding of the principles and strengths and limitations of various approaches. PSA engineers, chemical engineers, environmental chemists, academicians and managers who must make informed decisions about purchasing costly PSA systems will find Pressure Swing Adsorption of particular value.

The book is engineering oriented and covers a large variety of topics ranging from fundamental principles to performance evaluation and applications. It is written systematically and completely on the subject with a summary of state-of-the-art fuel cell technology, filling the need for a timely resource. This is a unique book serving academic researchers, engineers, as well as people working in the fuel cell industry. It is also of substantial interest to students, engineers, and scientists in mechanical engineering, chemistry and chemical engineering, electrochemistry, materials science and engineering, power generation and propulsion systems, and automobile engineering.

Principles of Soil Chemistry, Fourth Edition

An Introduction

Theory and Application

Design, Simulation and Optimization of Adsorptive and Chromatographic Separations: A Hands-On Approach

Principles of Colloid and Surface Chemistry

Adsorption Technology in Water Treatment

This 1973 book was written to provide senior undergraduates and first-year graduate students with a guide to the Hammett equation.

Proceedings of the NATO Advanced Study Institute, Vimeiro, Portugal, July 17-29, 1988

Cellulose - Fundamental Aspects and Current Trends consists of 10 chapters written by international subject matter experts investigating the characteristics and current applications of this fascinating material. This book will help the reader to develop a deeper understanding about the concepts related to cellulose and the nanocellulose structure, modification, production, dissolution, and application. Biosynthesis mechanisms and medical applications of microbial cellulose are also discussed. This book will serve as the starting point for materials science researchers, engineers, and technologists from diverse backgrounds in physics, chemistry, biology, materials science, and engineering who want to know and better understand the unique characteristics of the most abundant biopolymer on earth.

The book starts with a theoretical understanding of electrocatalysis in the framework of density functional theory followed by a vivid review of oxygen reduction reactions. A special emphasis has been placed on electrocatalysts for a proton-exchange membrane-based fuel cell where graphene with noble metal dispersion plays a significant role in electron transfer at thermodynamically favourable conditions. The latter part of the book deals with two 2D

materials with high economic viability and process ability and MoS₂ and WS₂ for their prospects in water-splitting from renewable energy.

Surface Reactions

Adsorption Analysis: Equilibria And Kinetics (With Cd Containing Computer Matlab Programs)

Adsorption, Ion Exchange and Catalysis

Fundamental Concepts in Heterogeneous Catalysis

Electrocatalysts for Fuel Cells and Hydrogen Evolution

The most important aspects of modern surface science are covered. All topics are presented in a concise and clear form accessible to a beginner. At the same time, the coverage is comprehensive and at a high technical level, with emphasis on the fundamental physical principles. Numerous examples, references, practice exercises, and problems complement this remarkably complete treatment, which will also serve as an excellent reference for researchers and practitioners. The textbook is ideal for students in engineering and physical sciences.

Expanding on the ideas first presented in Gerhard Ertl's acclaimed Baker Lectures at Cornell University, *Reactions at Solid Surfaces* comprises an authoritative, self-contained, book-length introduction to surface reactions for both professional chemists and students alike. Outlining our present understanding of the fundamental processes underlying reactions at solid surfaces, the book provides the reader with a complete view of how chemistry works at surfaces, and how to understand and probe the dynamics of surface reactions. Comparing traditional surface probes with more modern ones, and bringing together various disciplines in a cohesive manner, Gerhard Ertl's *Reactions at Solid Surfaces* serves well as a primary text for graduate students in introductory surface science or chemistry, as well as a self-teaching resource for professionals in surface science, chemical engineering, or nanoscience.

This indispensable new text is a comprehensive treatment of health and safety problems in agriculture and related industries. Respiratory health risks, grain dust exposures, occupational asthma, chronic lung disease, chemical exposures, incidence of cancer in farmers, accidents and injuries, and stress and psychiatric problems are addressed, from basic science to practical clinical aspects. This useful handbook provides a wealth of information for practicing clinicians, researchers, public health workers, those engaged in occupational health, programming, private industry, governmental public health departments, and farmers themselves.

Students contemplating careers in chemistry, whether in research, practice, or academia, obviously need a solid grounding in proper research methodology, reasoning, and analysis. However, there are few resources available that efficiently and effectively introduce these concepts and techniques and inspire students to undertake advanced research, particularly in the area of catalysis. *Catalysis: Principles and Applications* evolved out of a special, resoundingly successful short course for graduate students interested in catalysis. It covers nearly the entire gamut of the subject, from its fundamentals to its

modern, applied aspects. The chapters were contributed by catalysis specialists from leading academic institutions, national laboratories and industrial R&D labs. Because they are based on the authors' lecture notes, each chapter is highly accessible and for the most part self-contained. Topics include various spectroscopic methods, biocatalysis, x-ray and thermal analysis, photocatalysis, and recent developments, such as solid acid catalysts, fine chemical synthesis, and computer-aided catalyst design. The book also contains discussions on a variety of modern applications, including environmental pollution control, petroleum refining, fuel cells, and monomolecular films. Logically presented, well-illustrated, and thoroughly referenced, *Catalysis: Principles and Applications* offers an outstanding basis for courses in catalysis. It not only imparts the fundamentals, synthesis, characterization, and applications of catalysis, but does so in a way that will motivate students to pursue more advanced studies and ultimately careers in the field.

Concepts of Modern Catalysis and Kinetics

Physico-Chemical Wastewater Treatment and Resource Recovery

Adsorption Refrigeration Technology

Determining the Order of Reaction as a Means of Identifying the Physical Principles of Adsorption Phenomena

Principles of Soil Chemistry, Third Edition,

The Principles of Chemical Equilibrium

Heterogeneous catalysis provides the backbone of the world's chemical and oil industries. The innate complexity of practical catalytic systems suggests that useful progress should be achievable by investigating key aspects of catalysis by experimental studies on idealised model systems. Thin films and supported clusters are two promising types of model system that can be used for this purpose, since they mimic important aspects of the properties of practical dispersed catalysts. Similarly, appropriate theoretical studies of chemisorption and surface reaction clusters or extended slab systems can provide valuable information on the factors that underlie bonding and catalytic activity. This volume describes such experimental and theoretical approaches to the surface chemistry and catalytic behaviour of metals, metal oxides and metal/metal oxide systems. An introduction to the principles and main themes of heterogeneous catalysis is followed by detailed accounts of the application of modern experimental and theoretical techniques to fundamental problems. The application of advanced experimental methods is complemented by a full description of theoretical procedures, including Hartree-Fock, density functional and similar techniques. The relative merits of the various approaches are considered and directions for future progress are indicated.

Providing an integrated approach to the various aspects of catalysis, this textbook is ideal for graduate students from catalysis, engineering, and organic synthesis.

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.

A treatment of the important aspects of physical chemistry on metal surfaces, including selective oxidation, desulfurization, cyclization, metal-organic chemical vapor deposition, alkane activation and hydrogen dissociation dynamics. Case studies focus on the chemistry of selected systems, rather than the techniques, to convey the excitement of recent developments.

Adsorption: Science and Technology

Fundamentals, Processes, and Modeling

Comprehensive Energy Systems

Principles of Chemical Kinetics

Principles of Soil Chemistry

With Applications in Chemistry and Chemical Engineering

In the past 12 years since its publication, Concepts of Modern Catalysis and Kinetics has become a standard textbook for graduate students at universities worldwide. Emphasizing fundamentals from thermodynamics, physical chemistry, spectroscopy, solid state chemistry and quantum chemistry, it introduces catalysis from a molecular perspective, and stresses how it is interwoven with the field of reaction kinetics. The authors go on to explain how the world of reacting molecules is connected to the real world of industry, by discussing the various scales (nano - micro - macro) that play a role in catalysis. Reflecting the modern-day focus on energy supplies, this third edition devotes attention to such processes as gas-to-liquids, coal-to-liquids, biomass conversion and hydrogen production.

From reviews of the prior editions: 'Overall, this is a valuable book that I will use in teaching undergraduates and postgraduates.' (Angewandte Chemie - I. E.)

'...this excellent book is highly recommended to students at technical universities, but also entrants in chemical industry. Furthermore, this informative handbook is also a must for all professionals in the community.' (AFS) 'I am impressed by the coverage of the book and it is a valuable addition to the catalysis literature and I highly recommend purchase' (Energy Sources)

Comprehensive Energy Systems provides a unified source of information covering the entire spectrum of energy, one of the most significant issues humanity has to face. This comprehensive book describes traditional and novel energy systems, from single generation to multi-generation, also covering theory and applications. In addition, it also presents high-level coverage on energy policies, strategies, environmental impacts and sustainable development. No other published work covers such breadth of topics in similar depth. High-level sections include Energy Fundamentals, Energy Materials, Energy Production, Energy Conversion, and Energy Management. Offers the most comprehensive resource available on the topic of energy systems Presents an authoritative resource authored and edited by leading experts in the field Consolidates information currently scattered in publications from different research fields (engineering as well as physics, chemistry, environmental sciences and economics), thus ensuring a common standard and language

"All fields of chemistry involve the principles of chemical kinetics. Important reactions take place in gases, solutions, and solids. This book provides the necessary tools for studying and understanding interactions in all of these phases. Derivations are presented in detail to make them intelligible to readers whose background in mathematics is not extensive."--BOOK JACKET.

The book on Physico-Chemical Treatment of Wastewater and Resource Recovery provides an efficient and low-cost solution for remediation of wastewater. This book focuses on physico-chemical treatment via advanced oxidation process, adsorption, its management and recovery of valuable chemicals. It discusses treatment and recovery process for the range of pollutants including BTX, PCB, PCDDs, proteins, phenols, antibiotics, complex organic compounds and metals. The occurrence of persistent pollutants poses deleterious effects on human and environmental health. Simple solutions for recovery of valuable chemicals and water during physico-chemical treatment of wastewater are discussed extensively. This book provides necessary knowledge and experimental studies on emerging physico-chemical processes for reducing water pollution and resource recovery.

Surface Science

Principles of Health and Safety in Agriculture

Surface Chemistry and Catalysis

Cellulose

Fundamental Aspects and Current Trends

Separation Process Principles with Applications Using Process Simulators, 4th Edition

A comprehensive resource to the construction, use, and modification of the wide variety of adsorptive and chromatographic separations Design, Simulation and Optimization of Adsorptive and Chromatographic Separations offers the information needed to effectively design, simulate, and optimize adsorptive and chromatographic separations for a wide range of industrial applications. The authors?noted experts in the field?cover the fundamental principles, the applications, and a range of modeling techniques for the processes. The text presents a unified approach that includes the ideal and intermediate equations and offers a wealth of hands-on case studies that employ the rigorous simulation packages Aspen Adsorption and Aspen Chromatography. The text reviews the effective design strategies, details design considerations, and the assumptions which the modelers are allowed to make. The authors also cover shortcut design methods as well as mathematical tools that help to determine optimal operating conditions. This important text: -Covers everything from the underlying phenomena to model optimization and the customization of model code -Includes practical tutorials that allow for independent review and study -Offers a comprehensive review of the construction, use, and modification of the wide variety of adsorptive and chromatographic separations -Contains contributions from three noted experts in the field Written for chromatographers, process engineers, chemists, and other professionals, Design, Simulation and Optimization of Adsorptive and Chromatographic Separations offers a comprehensive review of the construction, use, and modification of adsorptive and chromatographic separations.

Learn the secrets of soil chemistry and its role in agriculture and the environment. Examine the fundamental laws of soil chemistry, how they affect dissolution, cation and anion exchange, and other reactions. Explore how water can form water-bridges and hydrogen bonding, the most common forces in adsorption, chelation, and more. Discover how electrical charges develop in soils creating electrochemical potentials forcing ions to move into the plant body through barriers such as root membranes, nourishing crops and plants. You can do all this and more with Principles of Soil Chemistry, Fourth Edition. Since the first edition published in 1982, this resource has made a name for itself as a textbook for upper level undergraduates and as a handy reference for professionals and scientists. This fourth edition reexamines the entire reach of soil chemistry while maintaining the clear, concise style that made previous editions so user-friendly. By completely revising, updating, and incorporating a decade's worth of new information, author Kim Tan has made this edition an entirely new and better book. See what's new in the Fourth Edition Reexamines atoms as the smallest particle that will enter into chemical reactions by probing new advances testifying the presence of subatomic particles and concepts such as string theory Underscores oxygen as the key element in soil air and atmosphere for life on earth Reevaluates the idea of transformation of orthoclase into albite by simple cation exchange reactions as misleading and bending scientific concepts of ion exchange over the limit of truth Examines the role of fertilizers, sulfur, pyrite, acid rain, and nitrogen fixation in soil acidity, underscoring the controversial effect of nitrification on increasing soil acidity over time Addresses the old and new approaches to humic acids by comparing the traditional operational concept against the currently proposed supramolecular and pseudomicellar concept Proposes soil organics, such as nucleic acids of DNA and others, to also adsorb cation ions held as diffusive ion clouds around the polymers Tan explains, in easy and simple language, the chemical make-up of the four soil constituents, their chemical reactions and interactions in soils as governed by basic chemical laws, and their importance in agriculture, industry, and the environment. He differentiates soil chemistry from geochemistry and physical chemistry. Containing more than 200 equations, 123 figures, and 38 tables, this popular text and resource supplies a comprehensive treatment of soil chemistry that builds a foundation for work in environmental pollution, organic and inorganic soil contamination, and potential ecological health and environmental health risks. The first up-to-date summary and review for the fundamental principles and industrial practice of adsorption separation processes in more than 30 years. Emphasizes the understanding of adsorption column dynamics and the modeling of adsorption systems, as well as fundamental aspects of kinetics and equilibria.

Principles of Adsorption and Reaction on Solid Surfaces As with other books in the field, Principles of Adsorption and Reaction on Solid Surfaces describes what occurs when gases come in contact with various solid surfaces. But, unlike

all the others, it also explains why. While the theory of surface reactions is still under active development, the approach Dr. Richard Masel takes in this book is to outline general principles derived from thermodynamics and reaction rate theory that can be applied to reactions on surfaces, and to indicate ways in which these principles may be applied. The book also provides a comprehensive treatment of the latest quantitative surface modeling techniques with numerous examples of their use in the fields of chemical engineering, physical chemistry, and materials science. A valuable working resource and an excellent graduate-level text, Principles of Adsorption and Reaction on Solid Surfaces provides readers with:

- * A detailed look at the latest advances in understanding and quantifying reactions on surfaces*
- * In-depth reviews of all crucial background material*
- * 40 solved examples illustrating how the methods apply to catalysis, physical vapor deposition, chemical vapor deposition, electrochemistry, and more*
- * 340 problems and practice exercises*
- * Sample computer programs*
- * Universal plots of many key quantities*
- * Detailed, class-tested derivations to help clarify key results*

The recent development of quantitative techniques for modeling surface reactions has led to a number of exciting breakthroughs in our understanding of what happens when gases come in contact with solid surfaces. While many books have appeared describing various experimental modeling techniques and the results obtained through their application, until now, there has been no single-volume reference devoted to the fundamental principles governing the processes observed. The first book to focus on governing principles rather than experimental techniques or specific results, Principles of Adsorption and Reaction on Solid Surfaces provides students and professionals with a quantitative treatment of the application of principles derived from the fields of thermodynamics and reaction rate theory to the investigation of gas adsorption and reaction on solid surfaces. Writing for a broad-based audience including, among others, chemical engineers, chemists, and materials scientists, Dr. Richard I. Masel deftly balances basic background in areas such as statistical mechanics and kinetics with more advanced applications in specialized areas. Principles of Adsorption and Reaction on Solid Surfaces was also designed to provide readers an opportunity to quickly familiarize themselves with all of the important quantitative surface modeling techniques now in use. To that end, the author has included all of the key equations involved as well as numerous real-world illustrations and solved examples that help to illustrate how the equations can be applied. He has also provided computer programs along with universal plots that make it easy for readers to apply results to their own problems with little computational effort. Principles of Adsorption and Reaction on Solid Surfaces is a valuable working resource for chemical engineers, physical chemists, and materials scientists, and an excellent text for graduate students in those disciplines.

Principles and Practice of Heterogeneous Catalysis

The Hammett Equation

Contemporary Catalysis

Design of Operations and Environmental Applications

Principles of Fuel Cells

Principles and Applications

Incorporating fundamental principles as well as up-to-date applications in soil formation, this work emphasizes the equal importance of organic and inorganic soil constituents by delineating the role of complex carbohydrates, amino acids, proteins, lipids, nucleic acids, lignins, enzymes, and humic acids in soil reactions. This edition features coverage of the relation of pe-pH with the biochemical cycle, soil air quality and soil humidity, thermodynamics in cation exchange and its connection with the quantity/intensity ratio, and more.

This book is based on a graduate course and suitable as a primer for any newcomer to the field, this book is a detailed introduction to the experimental and computational methods that are used to study how solid surfaces act as catalysts.

Features include: First comprehensive description of modern theory of heterogeneous catalysis Basis for understanding and designing experiments in the field Allows reader to understand catalyst design principles Introduction to important elements of energy transformation technology Test driven at Stanford University over several semesters

Gives readers a detailed understanding of adsorption refrigeration technology, with a focus on practical applications and environmental concerns Systematically covering the technology of adsorption refrigeration, this book provides readers with a technical understanding of the topic as well as detailed information on the state-of-the-art from leading researchers in the field. Introducing readers to background on the development of adsorption refrigeration, the authors also cover the development of adsorbents, various thermodynamic theories, the design of adsorption systems and adsorption refrigeration cycles. The book guides readers through the research process, covering key aspects such as: the principle of adsorption refrigeration; choosing adsorbents according to different characteristics; thermodynamic equations; methods for the design of heat exchangers for adsorbers; and the advanced adsorption cycles needed. It is also valuable as a reference for professionals working in these areas. Covers state-of-the-art of adsorption research and technologies for relevant applications, working from adsorption working pairs through to the application of adsorption refrigeration technology for low grade heat recovery Assesses sustainable alternatives to traditional refrigeration methods, such as the application of adsorption refrigeration systems for solar energy and waste heat Includes a key chapter on the design of adsorption refrigeration systems as a tutorial for readers new to the topic; the calculation models for different components and working processes are also included Takes real-world examples giving an insight into existing products and

installations and enabling readers to apply the knowledge to their own work Academics researching low grade energy utilization and refrigeration; Graduate students of refrigeration and low grade energy utilization; Experienced engineers wanting to renew knowledge of adsorption technology, Engineers working at companies developing adsorption chillers; Graduate students working on thermally driven systems; Advanced undergraduates for the Refrigeration Principle as a part of thermal driven refrigeration technology.

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.

Theory to Design

Principles of Adsorption and Reaction on Solid Surfaces

Principles of Medical Biochemistry E-Book

Principles of General Physiology

Principles of Adsorption and Adsorption Processes

Chemisorption and Reactivity on Supported Clusters and Thin Films:

Sample Text

Learn the secrets of soil chemistry and its role in agriculture and the environment. Examine the fundamental laws of soil chemistry, how they affect dissolution, cation and anion exchange, and other reactions. Explore how water can form water-bridges and hydrogen bonding, the most common forces in adsorption, chelation, and more. Discover how elect

This second, extended and updated edition presents the current state of kinetics of chemical reactions, combining basic knowledge with results recently obtained at the frontier of science. Special attention is paid to the problem of the chemical reaction complexity with theoretical and methodological concepts illustrated throughout by numerous examples taken from heterogeneous catalysis combustion and enzyme processes. Of great interest to graduate students in both chemistry and chemical engineering.

This book is a progressive presentation of kinetics of the chemical reactions. It provides complete coverage of the domain of

chemical kinetics, which is necessary for the various future users in the fields of Chemistry, Physical Chemistry, Materials Science, Chemical Engineering, Macromolecular Chemistry and Combustion. It will help them to understand the most sophisticated knowledge of their future job area. Over 15 chapters, this book presents the fundamentals of chemical kinetics, its relations with reaction mechanisms and kinetic properties. Two chapters are then devoted to experimental results and how to calculate the kinetic laws in both homogeneous and heterogeneous systems. The following two chapters describe the main approximation modes to calculate these laws. Three chapters are devoted to elementary steps with the various classes, the principles used to write them and their modeling using the theory of the activated complex in gas and condensed phases. Three chapters are devoted to the particular areas of chemical reactions, chain reactions, catalysis and the stoichiometric heterogeneous reactions. Finally the non-steady-state processes of combustion and explosion are treated in the final chapter.

Science, Technology and Applications

Reactions at Solid Surfaces

Towards an Understanding of Microscopic Processes in Catalysis

Chemical Process Principles ...: Kinetics and catalysis

Adsorption, Ion Exchange and Catalysis is essentially a mixture of environmental science and chemical reactor engineering. More specifically, three important heterogeneous processes, namely, adsorption, ion exchange and catalysis, are analysed, from fundamental kinetics to reactor design with emphasis on their environmental applications. In Chapter 1, the subject of air and water pollution is dealt with. Data about pollutants and emission sources are given and the treatment methods are shortly presented. In Chapter 2, the very basics and historical development of adsorption, ion exchange and catalysis are presented as well as their environmental applications. Chapter 3 is devoted to heterogeneous processes and reactor analysis. All types of reactors are described in depth and reactor modelling, hydraulics and mass/heat transfer phenomena are examined for each type of reactor. Chapters 4 and 5 are dedicated to adsorption & ion exchange and catalysis, respectively. The basic principles are presented including kinetics, equilibrium, mass/heat transfer phenomena as well as the analytical solutions of the reactor models presented in Chapter 3. In the sixth chapter, the subject of scale up is approached. The two Annexes at the end of the book contain physical properties of substances of environmental interest as well as unit conversion tables. Finally, nearly all the examples contained are based on real experimental data found in literature with environmental interest. Most of the examples consider all aspects of operation design - kinetics, hydraulics and mass transfer. * Provides basic knowledge of major environmental problems and connects them to chemical engineering