

Adsorption Analysis Equilibria And Kinetics Series On Chem Engineering

This book is intended to present for the first time experimental methods to measure equilibria states of pure and mixed gases being adsorbed on the surface of solid materials. It has been written for engineers and scientists from industry and academia who are interested in adsorption based gas separation processes and/or in using gas adsorption for characterization of the porosity of solid materials. This book is the result of a fruitful collaboration of a theoretician (JUK) and an experimentalist (RS) over more than twelve years in the field of gas adsorption systems at the Institute of Fluid- and Thermodynamics (IFT) at the University of Siegen, Siegen, Germany. This collaboration resulted in the development of several new methods to measure not only pure gas adsorption, but gas mixture or coadsorption equilibria on inert porous solids. Also several new theoretical results could be achieved leading to new types of so-called adsorption isotherms based on the concepts of molecular association and – phenomenologically speaking – on that of thermodynamic phases of fractal dimension. Naturally, results of international collaboration of the authors over the years (1980-2000) also are included.

Over the last decade, the biggest advances in physical chemistry have come from thinking smaller. The leading edge in research pushes closer to the atomic frontier with every passing year. Collecting the latest developments in the science and engineering of finely dispersed particles and related systems, *Finely Dispersed Particles: Micro-, Nano-, and Atto-Engineering* explores heat, mass, momentum and electron transfer phenomena of well-characterized interfaces at the milli-, micro-, nano-, and atto-scales. An interdisciplinary team of leading experts from around the world discuss recent concepts in the physics and chemistry of various well-studied interfaces of rigid and deformable particles in homo- and hetero-aggregate dispersed systems, including emulsions, dispersoids, foams, fluosols, polymer membranes, and biocolloids. The contributors clearly elucidate the hydrodynamic, electrodynamic, and thermodynamic instabilities that occur at interfaces, as well as the rheological properties of interfacial layers responsible for droplets, particles, and droplet-particle-film structures in finely dispersed systems. The book examines structure and dynamics from various angles, such as relativistic and non-relativistic theories, molecular orbital methods, and transient state theories. With a comprehensive survey of our current understanding, *Finely Dispersed Particles: Micro-, Nano-, and Atto-Engineering* provides a solid platform for further exploration and discovery at increasingly smaller scales.

This book presents the latest research on adsorption science and technology. It covers various aspects of materials, solid characterization, equilibria, kinetics determination and new processes. Contents: Cluster Mediated Filling of Water and Alcohol on Microporous Carbon Alloys (K Kaneko et al.) Direct Measurement of Transient Concentration Profiles in Molecular Sieve Particles and Columns by MRI (N Karsten-Bär et al.) Computer Simulation Studies of Wetting on Heterogeneous Surfaces (S Curtarolo et al.) New Adsorbents for Gas Separation by Weak Chemical Bonds (R T Yang) Measurement of Adsorbate Density Profiles in Activated Carbon with the Aid of 1H-MRI (F B Aarden et al.) Interaction Between Adsorption and Condensation Processes in a Pore-Relation Between Condensation Pressure and Pore Width (C Aharoni) Isothermic Heat: A Criterion for Equilibrium Model Selection (A Ahmadpour & D D Do) Adsorption Characteristics and Isotherm Relationships of Activated Carbons Developed from Lignite and Peat (S J Allen et al.) and other papers Readership: Engineers and scientists working in adsorption and separation science and engineering, as well as research students in chemical engineering and physical chemistry. Keywords:

This is the first volume on adsorption using green adsorbents and is written by international contributors who are the leading experts in the adsorption field. The first volume provides an overview of fundamentals and design of adsorption processes. For people who are new to the field, the book starts by two overview chapters presenting the principles and properties of wastewater treatment and adsorption processes. The book also provides a comprehensive source of knowledge on acid-base properties of biosorbents. It discusses fractal-like kinetic models for fluid-solid adsorption, reports on the chemical characterization of oxidized activated carbons for metal removal, and the use of magnetic biosorbents in water treatment. Furthermore, the thermodynamic properties of metals adsorption by green adsorbents, and biosorption of polycyclic aromatic hydrocarbons and organic pollutants are reviewed, and finally the recent trends and impact of nanomaterials as green adsorbent and potential catalysts for environmental applications are summarized. The audience for this book includes students, environmentalists, engineers, water scientists, civil and industrial personnel who wish to specialize in adsorption technology. Academically, this book will be of use to students in chemical and environmental engineering who wish to learn about adsorption and its fundamentals. It has also been compiled for practicing engineers who wish to know about recent developments on adsorbent materials in order to promote further research toward improving and developing newer adsorbents and processes for the efficient removal of pollutants from industrial effluents. It is hoped that the book will serve as a readable and useful presentation not only for undergraduate and postgraduate students but also for the water scientists and engineers and as a convenient reference handbook in the form of numerous recent examples and appended information.

New Polymer Nanocomposites for Environmental Remediation

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

Fundamentals, Processes, and Modeling

Adsorption Processes for Water Treatment and Purification

Experimental Methods and Adsorptive Isotherms

Advances in Gas Processing: Proceedings of the 2nd Annual Gas Processing Symposium 11-14 January, 2010, Doha, Qatar, reviews the state of knowledge in gas processing. The contributions are organized around five main themes: (i) environmental sustainability; (ii) natural gas processing technologies; (iii) energy efficiency in operations; (iv) design and safety; and (v) operational excellence. The papers on environmental sustainability cover topics such as the biogasification of waste monoethanolamine; the role of LNG in a carbon constrained world; and sustainable water management. The papers on natural gas processing technologies include the removal of acid gases from natural gas streams via membrane technology and selective control of Fischer-Tropsch synthesis hydrocarbons product distribution. The papers on energy efficiency in operations cover lifted turbulent jet flame in a cross-flow; novel hybrid biomass and coal processes; and the adoption of plug-in hybrid electric vehicles (PHEVs). The papers on design and safety include studies on the optimal design and operation of a GTL process and efficient design, operating, and control strategies for LNG plants. The papers on operational excellence deal with topics such as chemicals in gas

processing; the monitoring and optimization of hydrocarbon separation equipment; and the inhibition of gas hydrate formation. * Provides a state-of-the-art review of gas processing technologies * Covers design, operating tools, and methodologies * Includes case studies and practical applications

This book aims to provide the scientific community with a novel and valuable approach based on fractal geometry concepts on the important properties and processes of diverse environmental systems. The interpretation of complex environmental systems using modern fractal approaches is compared and contrasted with the more classical approaches. The book will provide the fundamental knowledge necessary for solving practical environmental problems. Furthermore, it examines how the fractal approach has been applied in order to understand the structure and reactivity of natural, environmental systems including flocs, sediments, soils, microorganisms and humic substances.

Applied Chemistry and Chemical Engineering, Volume 4: Experimental Techniques and Methodical Developments provides a detailed yet easy-to-follow treatment of various techniques useful for characterizing the structure and properties of engineering materials. This timely volume provides an overview of new methods and presents experimental research in applied chemistry using modern approaches. Each chapter describes the principle of the respective method as well as the detailed procedures of experiments with examples of actual applications and then goes on to demonstrate the advantage and disadvantages of each physical technique. Thus, readers will be able to apply the concepts as described in the book to their own experiments. The book is broken into several subsections: Polymer Chemistry and Technology Computational Approaches Clinical Chemistry and Bioinformatics Special Topics This volume presents research and reviews and information on implementing and sustaining interdisciplinary studies in science, technology, engineering, and mathematics.

The aim of this book has been to explore the variety of phenomena associated with the major forms of the material, while laying the foundation for a clear and detailed working and understanding of the materials. We tried to present new types of advanced materials, which are currently a hot topic, and provide readers with a selective review of important improvements in the field. I believe that every chapter in this book presents the progress in the subject and describes the latest advances in microporous and mesoporous materials.

Water Pollution VIII

Adsorption Technology in Water Treatment

Chromatography, Equilibria and Kinetics

Applied Chemistry and Chemical Engineering, Volume 4

Biophysical Chemistry of Fractal Structures and Processes in Environmental Systems

Methods and Applications

Thermochemical gas-solid reactions, as well as adsorption processes, are currently of significant interest for the design of heat storage systems. This book provides detailed models of these reactions and processes that account for heat and mass transport, chemical and physical reactions, and possible local thermal non-equilibrium. The underlying scientific theory behind the models is explained, laboratory tests are simulated, and methods for high-performance computing are discussed. Applications ranging from seasonal domestic heat storage to diurnally operating systems in concentrating solar power facilities are considered in these models, which are not available through any other sources. Finally, an outlook on future developments highlights emerging technologies. Activated Carbon Compendium provides a critical in-depth analysis of recent research into activated carbons, focussing on their wide-ranging applications, and the complexity and flexibility in their manufacture and use. Professor Harry Marsh has selected and reviewed 27 key papers originally published in Carbon over the last five years. The compendium represents an indispensable review of key work in the area. Areas include: The Activation Process, Modifications to Porosity, Properties of Activated carbons, Applications, Theoretical.

Biomass can be converted to energy, biofuels, and bioproducts via thermochemical conversion processes, such as combustion, pyrolysis, and gasification. Combustion technology is most widely applied on an industrial scale. However, biomass gasification and pyrolysis processes are still in the research and development stage. The major products from these processes are syngas, bio-oil, and char (called also biochar for agronomic application). Among these products, biomass chars have received increasing attention for different applications, such as gasification, co-combustion, catalysts or adsorbents precursors, soil amendment, carbon fuel cells, and supercapacitors. This Special Issue provides an overview of biomass char production methods (pyrolysis, hydrothermal carbonization, etc.), characterization techniques (e.g., scanning electronic microscopy, X-ray fluorescence, nitrogen adsorption, Raman spectroscopy, nuclear magnetic resonance spectroscopy, X-ray photoelectron spectroscopy, and temperature programmed desorption and mass spectrometry), their properties, and their suitable recovery processes.

This book provides recent advances in research on drying of particulate and porous materials. It is based on a selection of papers presented at the XI Polish Drying Symposium 2005. The contributions cover theoretical, as well as experimental and modeling research on heat and mass transfer processes during drying of porous material and fluidized beds. The book is a pioneering contribution to the science and technology of drying of particulate solids.

Sorption Enhancement of Chemical Processes

Biosorption for Wastewater Contaminants

Nanocomposite Sorbents for Multiple Applications

Qatar, January 10-14, 2010

Green Adsorbents for Pollutant Removal

Chitin and Chitosan

The fact that the surfaces of real solids are geometrically distorted and chemically non-uniform has long been realized by the scientists investigating various phenomena occurring on solid surfaces. Even in the case when diffraction experiments show a well-organized bulk solid structure, the surface atoms or molecules will usually exhibit a much smaller degree of surface organization. In addition to the results obtained from electron diffraction, this can be seen in the impressive images obtained from STM and AFM microscopies. This geometric and chemical disorder is the source of the energetic heterogeneity for molecules adsorbing on real solid surfaces. Hundreds of papers have been published showing that this heterogeneity is a major factor in determining the behaviour of real adsorption systems. Studies of adsorption on energetically heterogeneous surfaces have proceeded along three somewhat separate paths, with only minor coupling of ideas. One was the study of adsorption equilibria on heterogeneous solid surfaces. The second path was the study of time evolution of adsorption processes such as surface diffusion or adsorption-desorption kinetics on heterogeneous surfaces, and the third was the study of adsorption in porous solids, or more generally, adsorption in systems with limited dimensions. The present monograph is a first attempt to provide a synthesis of the ways that surface geometric and energetic heterogeneities affect both the equilibria and the time evolution of adsorption on real solids. The book contains 17 chapters written by a team of internationally recognized specialists, some of whom have already published books on adsorption.

This book presents the first ever comprehensive survey of a new family of nanocomposite sorbents “ salt in porous matrix ” (CSPMs).

These composites have recently been developed for selective sorption of water, alcohols, ammonia, and carbon dioxide. They owe their origin to the catchy idea of target-oriented tailoring of materials with predetermined adsorption properties harmonized with a particular adsorption process. The book develops the concept of target-oriented synthesis and suggests tools for tailoring new adsorbent materials adapted to multiple practical applications. It describes properties of approximately 50 new CSPMs of water, alcohols, ammonia, and carbon dioxide, including the data obtained in the author's laboratory and literature available by the end of 2018. These data can be used for engineering calculations and analysis of practical applications. The book also discusses potential applications of these sorbents for storage and transformation of low-temperature heat, gas drying, maintenance of relative humidity in museums, and regeneration of heat and moisture in ventilation systems.

This book publishes the proceedings of the Eighth International Conference on Modelling, Measuring and Prediction of Water Pollution. Water pollution is a subject of growing public concern. The scientific community has responded very rapidly to the need for studies capable of relating the pollutant discharge with changes in the water quality. The results of these studies are permitting industries to employ more efficient methods of controlling and treating waste loads, and water authorities to enforce stricter regulations regarding this matter. Bringing together papers from world renowned experts in this field, the text encompasses themes such as: Groundwater and Aquifer Contamination; Wastewater Treatment; Re-use of Water; Lakes, Rivers and Wetlands; Coastal Areas and Seas; Biological Effects; Agricultural Pollution; Oil Spills; Mathematical and Physical Modeling; Experimental and Laboratory Work; Surveying Techniques, Monitoring and Remote Sensing; Remediation Studies; Health Risk; Social and Economic Issues; Pollution Prevention; GIS and Remote Sensing Applications; Environmental Management and Decision Analysis; Environmental Impact Assessment.

This thesis presents a combination of material synthesis and characterization with process modeling. In it, the CO₂ adsorption properties of hydrotalcites are enhanced through the production of novel supported hybrids (carbon nanotubes and graphene oxide) and the promotion with alkali metals. Hydrogen is regarded as a sustainable energy carrier, since the end users produce no carbon emissions. However, given that most of the hydrogen produced worldwide comes from fossil fuels, its potential as a carbon-free alternative depends on the ability to capture the carbon dioxide released during manufacture. Sorption-enhanced hydrogen production, in which CO₂ is removed as it is formed, can make a major contribution to achieving this. The challenge is to find solid adsorbents with sufficient CO₂ capacity that can work in the right temperature window over repeated adsorption-desorption cycles. The book presents a highly detailed characterization of the materials, together with an accurate measurement of their adsorption properties under dry conditions and in the presence of steam. It demonstrates that even small quantities of graphene oxide provide superior thermal stability to hydrotalcites due to their compatible layered structure, making them well suited as volume-efficient adsorbents for CO₂. Lastly, it identifies suitable catalysts for the overall sorption-enhanced water gas shift process.

Air, Gas, and Water Pollution Control Using Industrial and Agricultural Solid Wastes Adsorbents

Metal-Organic Frameworks and Covalent Organic Frameworks

Adsorption Science and Technology

Science and Engineering

Finely Dispersed Particles

The Engineering Handbook

This text discusses the synthesis, characterization, and application of metal-organic frameworks (MOFs) for the purpose of adsorbing gases. It provides details on the fundamentals of thermodynamics, mass transfer, and diffusion that are commonly required when evaluating MOF materials for gas separation and storage applications and includes a discussion of molecular simulation tools needed to examine gas adsorption in MOFs. Additionally, the work presents techniques that can be used to characterize MOFs after gas adsorption has occurred and provides guidance on the water stability of these materials. Lastly, applications of MOFs are considered with a discussion of how to measure the gas storage capacity of MOFs, a discussion of how to screen MOFs for filtration applications, and a discussion of the use of MOFs to perform industrial separations, such as olefin/paraffin separations. Throughout the work, fundamental information, such as a discussion on the calculation of MOF surface area and description of adsorption phenomena in packed-beds, is balanced with a discussion of the results from research literature.

This book reviews work that covers everything from basic chemistry to advanced applications. Chitin and chitosan are used in a plethora of applications from wastewater treatment to prosthetics. After introducing the subject of polysaccharides as a whole, the authors turn to the preparation of chitin and chitosan and the characterization of the latter. The book provides information on chitin chemistry, extraction of chitin, chitosan preparation processes, and the applications of their derivatives in various fields. Applications that are treated in detail include the adsorption of heavy metals for pollution prevention and clean-up, biosensors, various medical applications from anti-tumor activity to bone tissue engineering, agriculture and food production, and proton exchange in fuel cells. Chitin and Chitosan features: information on molecular structure, synthesis, properties, and latest research related to chitin and chitosan; coverage of a wide range of topics from the properties of chitosan to its derivatives and applications; in-depth information on biomedical applications of chitin and chitosan; and information that can be applied to other biopolymer processing engineering areas. This book will be of interest to practitioners working in a wide variety of industries for which chitin and chitosan are useful materials, researchers in biosensors and heavy-metal adsorption, and to academic researchers investigating the properties, preparation, and uses of these materials.

The problem of storing hydrogen safely and effectively is one of the major technological barriers currently preventing the widespread adoption of hydrogen as an energy carrier and the subsequent transition to a so-called hydrogen economy. Practical issues with the storage of hydrogen in both gas and liquid form appear to make reversible solid state hydrogen storage the most promising potential solution. Hydrogen Storage Materials addresses the characterisation of the hydrogen storage properties of the materials that are currently being considered for this purpose. The background to the topic is introduced, along with the various types of materials that are currently under investigation, including nanostructured interstitial and complex hydrides, and porous materials, such as metal-organic frameworks and microporous organic polymers. The main features of Hydrogen Storage Materials include: an overview of the different types of hydrogen storage materials and the properties that are of interest for their practical use; descriptions of the gas sorption measurement methods used to determine these properties, and the complementary techniques that can be used to help corroborate hydrogen uptake data; and extensive coverage of the practical considerations for accurate hydrogen sorption measurement that drive both instrument design and the development of experimental methodology. Hydrogen Storage Materials provides an up-to-date overview of the topic for experienced researchers, while including enough introductory material to serve as a useful, practical introduction for newcomers to the field.

This book focuses on structural characterisation techniques for porous materials. Covering a range of techniques, including gas sorption, mercury porosimetry, thermoporometry, NMR and imaging methods, this practical guide presents the basic theory behind each characterisation technique, and discusses the practicalities of the experimental and data analysis approaches needed for complex industrial samples. The book shows readers how to approach characterising a particular sort of material for the first time and then how to develop a strategy for more in-depth analysis. It also demonstrates how to determine the best techniques for solving particular problems, and describes methods of obtaining the required information, as well as the limitations of various methods. It particularly highlights a scientific approach involving parameter validation and simple acquisition. Featuring examples taken from case studies of real-world industrial materials, this book is intended for industrial practitioners and researchers. It provides a manual of potential techniques and answers questions concerning porous materials that arise in areas such as the catalyst industry, the oil and gas sector, batteries, fuel cells, tissue engineering scaffolds and drug delivery devices.

Activated Carbon Compendium

Hydrogen Storage Materials

Proceedings of the Second Pacific Basin Conference on Adsorption Science and Technology : Brisbane, Australia, 14-18 May 2000

A Collection of Papers from the Journal Carbon 1996-2000

Environmental Engineering Studies

Advances in Thermal Energy Storage Systems

This book focuses on the utilization of bio-resources and their conversion pathways for a sustainable future. Tapping into bio-resources by means of thermochemical and biochemical processes has attracted researchers from all over the world; it is a broad area that has given birth to concepts like the biorefinery, as well as a new stream known as biotechnology. Its scope includes biochemical and microbiological engineering, biocatalysis and biotransformation, biosynthesis and metabolic engineering, bioprocess and biosystem engineering, bioenergy and biorefineries, cell culture and biomedical engineering, food, agricultural and marine biotechnology, bioseparation and biopurification engineering, bioremediation and environmental biotechnology, etc. The book discusses a host of new technologies now being used to tap these resources with innovative bioprocesses. All chapters are based on outstanding research papers selected for and presented at the IconSWM 2018 conference.

New Polymer Nanocomposites for Environmental Remediation summarizes recent progress in the development of materials' properties, fabrication methods and their applications for treatment of contaminants, pollutant sensing and detection. This book presents current research into how polymer nanocomposites can be used in environmental remediation, detailing major environmental issues, and key materials properties and existing polymers or nanomaterials that can solve these issues. The book covers the fundamental molecular structure of polymers used in environmental applications, the toxicology, economy and life-cycle analysis of polymer nanocomposites, and an analysis of potential future applications of these materials. Recent research and development in polymer nanocomposites has inspired the progress and use of novel and cost-effective environmental applications. Presents critical, actionable guidelines to the structure and property design of nanocomposites in environmental remediation Focuses on taking technology out of the lab and into the real world Summarizes the latest developments in polymer nanocomposites and their applications in catalytic degradation, adsorptive removal and detection of contaminants in the environment Enables researchers to stay ahead of the curve, with a full discussion of regulatory issues and potential new applications and materials in this area This book is the proceedings of the second Pacific Basin Conference on Adsorption Science and Technology that was held May 14-18, 2000 in Brisbane, Australia.

Air and water pollution occurs when toxic pollutants of varying kinds (organic, inorganic, radioactive and so on) are directly or indirectly discharged into the environment without adequate treatment to remove these potential pollutants. There are a total of 13 book chapters in three sections contributed by significant number of expert authors around the world, aiming to provide scientific knowledge and up-to-date development of various solid wastes based cost-effective adsorbent materials and its sustainable application in the removal of contaminates/pollutants from air, gas and water. This book is useful for the professions, practicing engineers, scientists, researchers, academics and undergraduate and post-graduate students' interest on this specific area. ? Key Features: • Exclusive compilation of information on use of industrial and agricultural waste based adsorbents for air and water pollution abatement. • Explores utilization of industrial solid wastes in adsorptive purification and agricultural and agricultural by-products in separation and purification. • Discusses cost-effective solid wastes based emerging adsorbents. • Alternative adsorbents in the removal of a wide range of contaminants and pollutants from water is proposed. • Includes performance of unit operations in waste effluents treatment.

Biomass Chars: Elaboration, Characterization and Applications II

Models of Thermochemical Heat Storage

Modelling, Monitoring and Management

The Characterisation of Their Storage Properties

Structural Characterisation of Natural and Industrial Porous Materials: A Manual

Emerging Concepts in Analysis and Applications of Hydrogels

Gas Separation by Adsorption Processes provides a thorough discussion of the advancement in gas adsorption process. The book is comprised of eight chapters that emphasize the fundamentals concept

and principles. The text first covers the adsorbents and adsorption isotherms, and then proceeds to detailing the equilibrium adsorption of gas mixtures. Next, the book covers rate processes in adsorbents and adsorber dynamics. The next chapter discusses cyclic gas separation processes, and the remaining two chapters cover pressure-swing adsorption. The book will be of great use to students, researchers, and practitioners of disciplines that involve gas separation processes, such as chemical engineering. 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 adsorbents 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.

This book provides researchers and graduate students with an overview of the latest developments in and applications of adsorption processes for water treatment and purification. In particular, it covers current topics in connection with the modeling and design of adsorption processes, and the synthesis and application of cost-effective adsorbents for the removal of relevant aquatic pollutants. The book describes recent advances and alternatives to improve the performance and efficacy of this water purification technique. In addition, selected chapters are devoted to discussing the reliable modeling and analysis of adsorption data, which are relevant for real-life applications to industrial effluents and groundwater. Overall, the book equips readers with a general perspective of the potential that adsorption processes hold for the removal of emerging water pollutants. It can readily be adopted as part of special courses on environmental engineering, adsorption and water treatment for upper undergraduate and graduate students. Furthermore, the book offers a valuable resource for researchers in water production control, as well as for practitioners interested in applying adsorption processes to real-world problems in water treatment and related areas.

Sorption Enhancement of Chemical Processes, Volume 51 compiles the latest, state-of-the-art progress in the area of sorption enhanced processes. Topics in this updated volume include Sorption-enhanced water-gas-shift and steam methane reforming, CO₂ sorbents for sorption enhanced steam reforming, Reactor design for Sorption Enhanced Reforming using Ca-Cu chemical loops, Sorption-enhanced reaction with Simulated Moving Bed reactor (SMBR) and PermSMBR technologies, and the Process design and Technoeconomic assessment of sorption enhanced systems. This series contains contributions from leading scientists on the topics presented, providing tactics on a multiscaling approach, from materials, to reactor, to process design. Contains reviews by leading authorities in their respective areas Presents up-to-date reviews of sorption enhancement of chemical processes Includes a broad mix of U.S. and European authors, as well as academic, industrial and research institute perspectives

Novel Carbon Adsorbents

Micro-, Nano-, and Atto-Engineering

Supported Layered Double Hydroxides as CO₂ Adsorbents for Sorption-enhanced H₂ Production

Bioresource Utilization and Bioprocess

Fundamentals and Design

Polish Research on the Way to the EU

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.

A concise introduction to the chemistry and design principles behind important metal-organic frameworks and related porous materials Reticular chemistry has been applied to synthesize new classes of porous materials that are successfully used for myraid applications in areas such as gas separation, catalysis, energy, and electronics. Introduction to Reticular Chemistry gives an unique overview of the principles of the chemistry behind metal-organic frameworks (MOFs), covalent organic frameworks (COFs), and zeolitic imidazolate frameworks (ZIFs). Written by one of the pioneers in the field, this book covers all important aspects of reticular chemistry, including design and synthesis, properties and characterization, as well as current and future applications Designed to be an accessible resource, the book is written in an easy-to-understand style. It includes an extensive bibliography, and offers figures and videos of crystal structures that are available as an electronic supplement. Introduction to Reticular Chemistry: -Describes the underlying principles and design elements for the synthesis of important metal-organic frameworks (MOFs) and related materials -Discusses both real-life and future applications in various fields, such as clean energy and water adsorption -Offers all graphic material on a companion website -Provides first-hand knowledge by Omar Yaghi, one of the pioneers in the field, and his team. Aimed at graduate students in chemistry, structural chemists, inorganic chemists, organic chemists, catalytic chemists, and others, Introduction to Reticular Chemistry is a groundbreaking book that explores the chemistry principles and applications of MOFs, COFs, and ZIFs.

Advances in Thermal Energy Storage Systems, 2nd edition, presents a fully updated comprehensive analysis of thermal energy storage systems (TES) including all major advances and developments since the first edition published. This very successful publication provides readers with all the information related to TES in one resource, along with a variety of applications across the energy/power and construction sectors, as well as, new to this edition, the transport industry. After an introduction to TES systems, editor Dr. Prof. Luisa Cabeza and her team of expert authors consider the source, design and operation of the use of water, molten salts, concrete, aquifers, boreholes and a variety of phase-change materials for TES systems, before analyzing and simulating underground TES systems. This edition benefits from 5 new chapters covering the most advanced technologies including sorption systems, thermodynamic and dynamic modelling as well as applications to the transport industry and the environmental and economic aspects of TES. It will benefit researchers and academics of energy systems and thermal energy storage, construction engineering academics, engineers and practitioners in the energy and power industry, as well as architects of plants and storage systems and R&D managers. Includes 5 brand new chapters covering Sorption systems, Thermodynamic and dynamic models, applications to the transport sector, environmental aspects of TES and economic aspects of TES All existing chapters are updated and revised to reflect the most recent advances in the research and technologies of the field Reviews heat storage technologies, including the use of water, molten salts, concrete and boreholes in one comprehensive resource Describes latent heat storage systems and thermochemical heat storage Includes information on the monitoring and control of thermal energy storage systems, and considers their applications in residential buildings, power plants and industry

A comprehensive review of environmental remediation is presented with an emphasis on the role of clay minerals in water purification. In the first chapter, important aspects of environmental problems and possible solutions are discussed. In the second chapter, the application of natural clay minerals as environmental cleaning agents are explained. The discussion is focused on the role of different types of clay materials in hazardous substance removal from air, aqueous solutions, wastewater, aquaculture, ground water, etc. In the next chapter, the modification of clay materials is explored including the preparation of clay composite materials for environmental remediation. Various aspects of clay material modifications and the effects of clay surface chemistry on the removal of hazardous material is also discussed. Next, the equilibrium and kinetics of hazardous substance adsorption is presented. This chapter summarizes recent studies on the removal of hazardous substances from aqueous solutions and the environment using various types of clay minerals. The brief also includes various models used in adsorption studies and touches on the characterization of clay minerals.

Sorbent Deformation

Gas Adsorption in Metal-Organic Frameworks

Gas Separation by Adsorption Processes

Gas Adsorption Equilibria

Fundamentals and Applications

Introduction to Reticular Chemistry

Sorbent Deformation discusses the theoretical and experimental study of the deformation of solid bodies during their ad- or absorptive interaction

with gases or vapours. The book is the first monograph which deals with the problem of ad- and absorbent non-inertness, compiled from a 15-year study by the author on swelling or deformed ad- and absorptive systems. The results from the study are of practical and scientific value to engineers and scientists in the areas of physical chemistry, chemical engineering and environmental control. They could also be of interest to those looking to solve problems in such areas as forecasting, technological processing and fuel drying stimulation. · Provides novel, practical information on the behaviour of the systems used in environment control · Presents the derivation of the equation describing single- and multicomponent adsorption and absorption in swelling / deformed systems · Identifies the results of direct measurements on ad-and absorbent deformations (charcoals, clay minerals, organic cation substituted clay minerals, etc.) with a new high sensitivity method

This book is intended to present for the first time experimental methods to measure equilibria states of pure and mixed gases being adsorbed on the surface of solid materials. It has been written for engineers and scientists from industry and academia who are interested in adsorption-based gas separation processes and/or in using gas adsorption for characterization of the porosity of solid materials. Traditional and new measurement methods for gas adsorption equilibria are presented in Chaps. 2-6 and elucidated by quite a number of experimental data sets, most of them having been measured in the authors' laboratories. Special emphasis is given to uncertainties of data and pros and cons of all measurement methods are offered. Also the basic concepts underlying interpretation of measurements and calculations of adsorbed masses from measurement signals, are discussed in Chap. 1. The authors state that in publishing this book they "hope to contribute to... the development of effective and reliable methods to measure pure gas and gas mixture adsorption equilibria; preventing young (and old) experimenters from doing all the mistakes we have done during our laboratory work*); making experimental gas adsorption data measured today in many laboratories more easily comparable to each other, as methods and procedures should become more and more similar and possibly also will be standardized (IUPAC) in the years to come. "

ENVIRONMENTAL ENGINEERING IN THE HISTORICAL PERSPECTIVE Lucjan Pawlowski Information bombarding the nowadays Man may suggest that the world is on the way to an ecological catastrophe. I do not disregard the dangers we are facing now, but I would like to remind that since the beginning of existence Man has been facing numerous threats of an ecological character. First, they were caused by natural phenomena, such as huge forest fires, floods, earth quakes, and later on, caused by the development of our civilisation, Man who was becoming more and more powerful in his abilities started creating new, anthropogenic threats. We may look pessimistically at the development of our civilisation, having in mind the catastrophes caused by Man's activity; we may also look at the examples showing the development of knowledge and the skills derived from it, which enable the elimination of threats and, at the same time making Man's life richer. It is not possible to make an in-depth analysis of the phenomena mentioned above in a short opening speech of the Congress. Nevertheless, I would like to share with you an optimistic reflection. I think that we can observe two trends in the development of our civilisation - good alternates with evil, environmental threats with the hope for their overcoming, and events swing to both sides like a pendulum in a clock.

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

Clay Materials for Environmental Remediation

Experimental Techniques and Methodical Developments

Proceedings of the 2nd Annual Gas Processing Symposium

Equilibria and Dynamics of Gas Adsorption on Heterogeneous Solid Surfaces

Microporous and Mesoporous Materials

Drying of Porous Materials

Following in the lineage of Adsorption by Carbons (Bottani & Tascon, 2008), this work explores current research within contemporary novel carbon adsorbents. Both basic and applied aspects are discussed for this important class of materials. The first section of the book introduces physical adsorption and carbonaceous materials, and is followed by a section concerning the fundamentals of adsorption by carbons. This leads to development of a series of theoretical concepts that serve as an introduction to the following section in which adsorption is mainly envisaged as a tool to characterize the porous texture and surface chemistry of carbons. Particular attention is paid to novel nanocarbons, and the electrochemistry of adsorption by carbons is also addressed. Finally, several important technological applications of gas and liquid adsorption by carbons in areas such as environmental protection and energy storage constitute the last section of the book. Encompasses fundamental science of adsorption by carbons, in one location, supporting current R&D without extensive literature review Describes adsorption as it is currently applied to major novel types of carbon materials, including carbon gels, carbide-derived carbons, zeolite-templated carbons, hydrothermal carbons, carbon nanohorns and graphene Specific discussion of fuel storage, environmental remediation and biomedical applications, of contemporary interest to many surface chemists and applications-focused researchers

First published in 1995, The Engineering Handbook quickly became the definitive engineering reference. Although it remains a bestseller, the many advances realized in traditional engineering fields along with the emergence and rapid growth of fields such as biomedical engineering, computer engineering, and nanotechnology mean that the time has come to bring this standard-setting reference up to date. New in the Second Edition 19 completely new chapters addressing important topics in bioinstrumentation, control systems, nanotechnology, image and signal processing, electronics, environmental systems, structural systems 131 chapters fully revised and updated Expanded lists of engineering associations and societies The Engineering Handbook, Second Edition is designed to enlighten experts in areas outside their own specialties, to refresh the knowledge of mature practitioners, and to educate engineering novices. Whether you work in industry, government, or academia, this is simply the best, most useful engineering reference you can have in your personal, office, or institutional library.

This book is an Up-to-date and authoritative account on physicochemical principles, pharmaceutical and biomedical applications of hydrogels. It consists of eight contributions from different authors highlighting properties and synthesis of hydrogels, their characterization by various instrumental methods of analysis, comprehensive review on stimuli-responsive hydrogels and their diverse applications, and a special section on self-healing hydrogels. Thus, this book will equip academia and industry with adequate basic and applied principles related to hydrogels.

Pollution due to various anthropogenic activities continues to increase. In terms of water pollutants, organic and inorganic pollutants are the most problematic. Although several measures have been proposed and implemented to prevent or reduce contamination, their increased concentration in water bodies has created serious concerns. Over the years, the problem has been aggravated by industrialization, urbanization and the exploitation of natural resources. The direct discharge of wastewater contaminants and their geographical mobilization have caused an increase in concentration in ground, surface, fluvial and residual waters. Extensive information about detection and disposal methods is needed in order to develop technological solutions for a variety of environments, both urban and rural. This book provides up-to-date information on

wastewater contaminants, aimed at researchers, engineers and technologists working in this field. Conventional physicochemical techniques used to remove contaminants from wastewater include ion exchange, precipitation, degradation, coagulation, coating, membrane processes and adsorption. However, these applications have technological and economic limitations, and involve the release of large amounts of chemical reagents and by-products that are themselves difficult to remove. Biosorption - the use of organically generated material as an adsorbent - is attracting new research and scholarship. Thermally-treated calcined biomaterials may be treated to remove heavy metals from wastewater. To ensure the elimination of these contaminants, existing solutions must be integrated with intelligent biosorption functions. Biosorption for Wastewater Contaminants will find an appreciative audience among academics and postgraduates working in the fields of environmental biotechnology, environmental engineering, wastewater treatment technology and environmental chemistry.