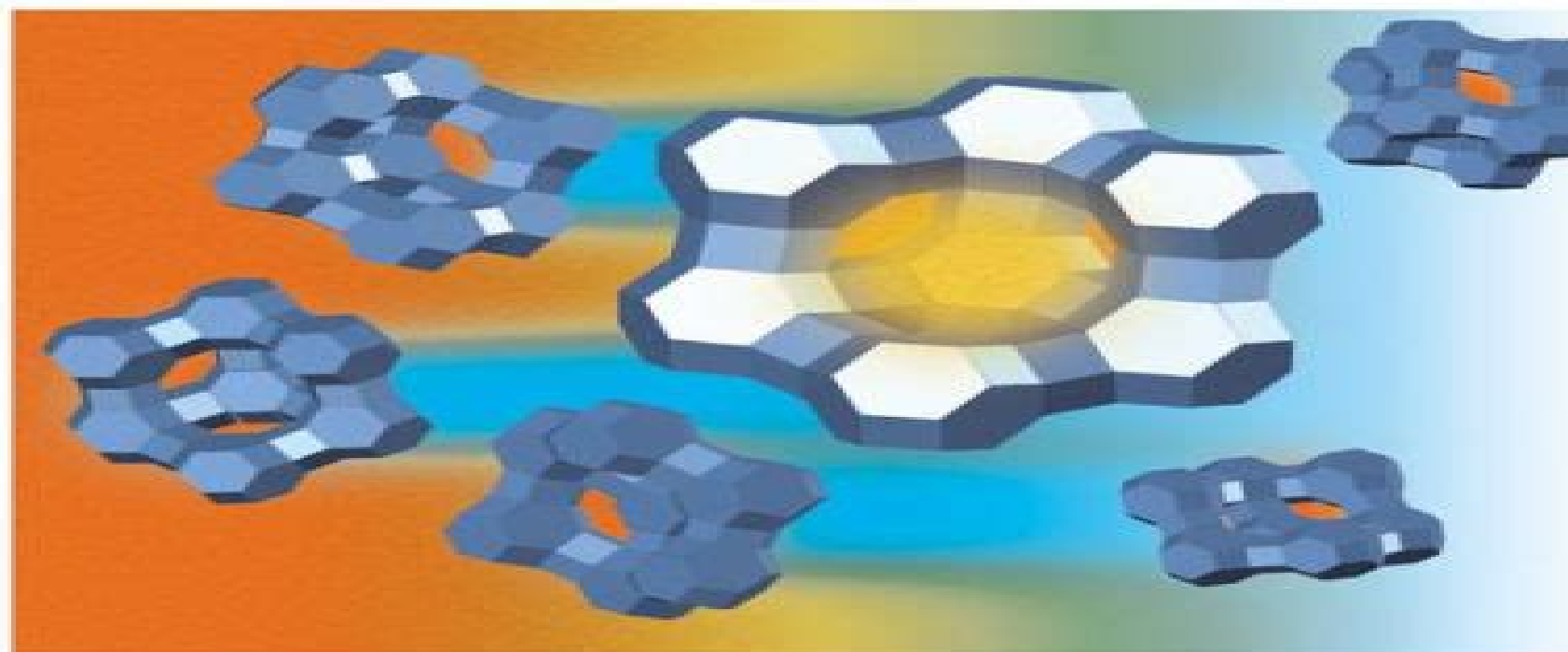


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Diffusion in Nanoporous Materials

Volume 1



Diffusion In Nanoporous Materials Volume 1 2

**Ahad Ghaemi,Zohreh
Khoshraftar,Fereshteh Pouresmaeil**

Diffusion In Nanoporous Materials Volume 1 2:

Gas Adsorption in Metal-Organic Frameworks T. Grant Glover, Bin Mu, 2018-09-03 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 to 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

Fluid Transport in Nanoporous Materials Wm. Curtis Conner, Jacques Fraissard, 2006-03-10 This NATO ASI involved teachings and perspectives of the state of the art in experimental and theoretical understandings of transport in nanoporous solids This workshop brought together the top scientists and engineers in each area to discuss the similarities and differences in each technique and theory The lectures truly bridge the gaps between these related areas and approaches The applications in future separations catalysis the environment and energy needs are obvious The solids comprised the newly developing molecular sieves biological systems and polymeric solids Transport in single particles in membranes and in commercial applications were reviewed and analyzed placing each in context Techniques such as uptake Chromatographic Frequency Response NMR Neutron Scattering and Infrared spectroscopies are discussed for mixtures as well as for single components Theoretical approaches such as Density Functional Theory Statistical Mechanics Molecular Dynamics and Maxwell Stefan Theory are employed to analyze the diffusional transport in confined environments spanning from sub nanometers to centimetre scales In all cases the theories are related to the experiments These lectures present a unique opportunity to learn the various theoretical and experimental approaches to analyze and understand transport in nanoporous materials

Handbook Of Porous Materials: Synthesis, Properties, Modeling And Key Applications (In 4 Volumes), 2020-10-20 This four volume handbook gives a state of the art overview of porous materials from synthesis and characterization and simulation all the way to manufacturing and industrial applications The editors coming from academia and industry are known for their didactic skills as well as their technical expertise Coordinating the efforts of 37 expert authors in 14 chapters they construct the story of porous carbons ceramics zeolites and polymers from varied viewpoints surface and colloidal science materials science chemical engineering and energy engineering Volumes 1 and 2 cover the fundamentals of preparation characterisation and simulation of porous materials Working from the fundamentals all the way

to the practicalities of industrial production processes the subjects include hierarchical materials in situ and operando characterisation using NMR X Ray scattering and tomography state of the art molecular simulations of adsorption and diffusion in crystalline nanoporous materials as well as the emerging areas of bio artifice and drug delivery Volume 3 focuses on porous materials in industrial separation applications including adsorption separation membrane separation and osmotic distillation Finally and highly relevant to tomorrow s energy challenges Volume 4 explains the energy engineering aspects of applying porous materials in supercapacitors fuel cells batteries electrolyzers and sub surface energy applications The text contains many high quality colourful illustrations and examples as well as thousands of up to date references to peer reviewed articles reports and websites for further reading This comprehensive and well written handbook is a must have reference for universities research groups and companies working with porous materials

Related Link s *Nanoporous Materials: Science And Engineering* G Q Max Lu,Xiu Song Zhao,2004-11-22 Porous materials are of scientific and technological importance because of the presence of voids of controllable dimensions at the atomic molecular and nanometer scales enabling them to discriminate and interact with molecules and clusters Interestingly the big deal about this class of materials is about the nothingness within the pore space International Union of Pure and Applied Chemistry IUPAC classifies porous materials into three categories micropores of less than 2 nm in diameter mesopores between 2 and 50 nm and macropores of greater than 50 nm In this book nanoporous materials are defined as those porous materials with pore diameters less than 100 nm Over the last decade there has been an ever increasing interest and research effort in the synthesis characterization functionalization molecular modeling and design of nanoporous materials The main challenges in research include the fundamental understanding of structure property relations and tailor design of nanostructures for specific properties and applications Research efforts in this field have been driven by the rapid growing emerging applications such as biosensor drug delivery gas separation energy storage and fuel cell technology nanocatalysis and photonics These applications offer exciting new opportunities for scientists to develop new strategies and techniques for the synthesis and applications of these materials This book provides a series of systematic reviews of the recent developments in nanoporous materials It covers the following topics 1 synthesis processing characterization and property evaluation 2 functionalization by physical and or chemical treatments 3 experimental and computational studies on fundamental properties such as catalytic effects transport and adsorption molecular sieving and biosorption 4 applications including photonic devices catalysis environmental pollution control biological molecules separation and isolation sensors membranes hydrogen and energy storage etc a

Nanoporous Materials III M. Jaroniec,Abdel Sayari,2002-05-15 Nanoporous Materials III contains the invited lectures and peer reviewed oral and poster contributions to be presented at the 3rd Conference on Nanoporous Materials which will be hosted in Ottawa Canada June 2002 The work covers complementary approaches to and recent advances in the field of nanostructured materials with pore sizes larger than 1nm such as periodic

mesoporous molecular sieves M41S and FSM16 and related materials including clays carbon molecular sieves colloidal crystal templated organic and inorganic materials porous polymers and sol gels The broad range of topics covered in relation to the synthesis and characterization of ordered mesoporous materials are of great importance for advanced adsorption catalytic and separation processes as well as the development of nanotechnology The contents of this title are based on topics to be discussed by invited lecturers which deal with periodic mesoporous organosilicas stability and catalytic activity of aluminosilicate mesostructures electron microscopy studies of ordered materials imprinted polymers and highly porous metal organic frameworks The other contributions deal with tailoring the surface and structural properties of nanoporous materials giving a detailed characterization as well as demonstrating their usefulness for advanced adsorption and catalytic applications

Stochastic Dynamics and Energetics of Biomolecular Systems Artem Ryabov, 2015-11-28 This thesis both broadens and deepens our understanding of the Brownian world It addresses new problems in diffusion theory that have recently attracted considerable attention both from the side of nanotechnology and from the viewpoint of pure academic research The author focusses on the diffusion of interacting particles in restricted geometries and under externally controlled forces These geometries serve for example to model ion transport through narrow channels in cell membranes or a Brownian particle diffusing in an optical trap now a paradigm for both theory and experiment The work is exceptional in obtaining explicit analytically formulated answers to such realistic experimentally relevant questions At the same time with its detailed exposition of the problems and a complete set of references it presents a clear and broadly accessible introduction to the domain Many of the problem settings and the corresponding exact asymptotic laws are completely new in diffusion theory

Electrochemically Engineering of Nanoporous Materials Abel Santos, 2018-10-10 This book is a printed edition of the Special Issue Electrochemically Engineering of Nanoporous Materials that was published in Nanomaterials

NMR Imaging in Chemical Engineering Siegfried Stapf, Song-I Han, 2006-05-12 How to use nuclear magnetic resonance imaging in chemical engineering Written by the internationally recognized top experts from academia and industry this first book dedicated to the topic provides an overview of existing methods and strategies to solve individual problems in chemical engineering Written in a simple and lively manner and backed by various industrial examples the book begins with a look at hardware and methods continuing on to cover porous materials fluids and flow of increasing complexity from different fields of Chemical Engineering before finishing off with a review of reactors and reactions The result allows engineers industrial and academic researchers and decision makers to gain a detailed insight into the NMR toolbox such that they can estimate the benefit of NMR imaging with regard to cost efficiency and scientific results

Porous Silicon: From Formation to Application: Biomedical and Sensor Applications, Volume Two Ghenadii Korotcenkov, 2016-01-05 Porous silicon is rapidly attracting increasing interest from various fields including optoelectronics microelectronics photonics medicine chemistry and biosensing This nanostructured and biodegradable material has a range of unique properties that

make it ideal for many applications For example the pores and surface chemistry of the mater **Nuclear Magnetic Resonance** G A Webb,2007-10-31 As a spectroscopic method Nuclear Magnetic Resonance NMR has seen spectacular growth over the past two decades both as a technique and in its applications Today the applications of NMR span a wide range of scientific disciplines from physics to biology to medicine Each volume of Nuclear Magnetic Resonance comprises a combination of annual and biennial reports which together provide comprehensive of the literature on this topic This Specialist Periodical Report reflects the growing volume of published work involving NMR techniques and applications in particular NMR of natural macromolecules which is covered in two reports NMR of Proteins and Acids and NMR of Carbohydrates Lipids and Membranes For those wanting to become rapidly acquainted with specific areas of NMR this title provides unrivalled scope of coverage Seasoned practitioners of NMR will find this an in valuable source of current methods and applications Specialist Periodical Reports provide systematic and detailed review coverage in major areas of chemical research Compiled by teams of leading authorities in the relevant subject areas the series creates a unique service for the active research chemist with regular in depth accounts of progress in particular fields of chemistry Subject coverage within different volumes of a given title is similar and publication is on an annual or biennial basis **Graphene Science**

Handbook, Six-Volume Set Mahmood Aliofkhazraei,Nasar Ali,William I. Milne,Cengiz S. Ozkan,Stanislaw Mitura,Juana L. Gervasoni,2016-04-26 Graphene is the strongest material ever studied and can be an efficient substitute for silicon This six volume handbook focuses on fabrication methods nanostructure and atomic arrangement electrical and optical properties mechanical and chemical properties size dependent properties and applications and industrialization There is no other major reference work of this scope on the topic of graphene which is one of the most researched materials of the twenty first century The set includes contributions from top researchers in the field and a foreword written by two Nobel laureates in physics **CO2 Adsorbents** Ahad Ghaemi,Zohreh Khoshraftar,Fereshteh Pouresmaeil,2025-09-10 CO2 Adsorbents

comprehensively explores the materials and technologies used for adsorbing carbon dioxide It covers materials synthesis characterization adsorption mechanisms applications modeling and potential environmental and industrial impacts to help readers find the best adsorbent for their needs Through its coverage of advanced research and technological developments in the field such as novel adsorbent materials innovative synthesis methods and advancements in scalable production techniques the book aims to contribute to the understanding of CO2 adsorption processes materials and their practical applications in addressing the global challenge of climate change and CO2 emissions reduction Presents an overview of different adsorbent materials used for CO2 capture and the methods of synthesis modification and functionalization to enhance their CO2 adsorption performance Describes characterization techniques used to assess the structural morphological and surface properties of CO2 adsorbents Explores the fundamental mechanisms behind CO2 adsorption of various materials the interactions between CO2 molecules and the adsorbent surface and the kinetics and thermodynamics of

CO₂ adsorption processes Discusses through real world case studies the applications of CO₂ adsorbents in various industries such as natural gas purification carbon capture and storage biogas upgrading and air purification and their potential in mitigating greenhouse gas emissions and addressing environmental concerns Analyzes the environmental impact and feasibility of using CO₂ adsorbents in real world scenarios and the challenges and benefits of integrating adsorption technologies into existing industrial processes Provides insights into potential improvements challenges and directions for further research and development Through its practical relevance advanced insights and focus on sustainability and innovation this text serves as a valuable resource for researchers engineers and professionals working in the field of carbon capture and utilization including those in chemical environmental and related engineering disciplines

Functional Nanostructured Membranes Enrico Drioli, Lidietta Giorno, Annarosa Gugliuzza, 2018-12-07 A membrane is considered the heart of every separation process because it is developed as a nanostructured nanofunctionalized thin barrier that controls the exchange between two phases not only by external forces and under the effect of fluid properties but also through the intrinsic characteristics of the membrane material itself This book compiles cutting edge research in membrane science nanomaterials and nanotechnologies mainly from interdisciplinary research groups at the Institute on Membrane Technology National Research Council ITM CNR Italy working on membrane design membrane process engineering and selected materials and practices for enhanced transport mass charge and energy It covers topics on the design of new nanostructured membranes with improved properties together with the identification of efficient transport property relationships It shares and strengthens the knowledge of making membrane technology a much more powerful and eco friendly route enabling one to provide prospective solutions and benefits for numerous fields of applications where traditional separation technologies suffer from many deficiencies It is a great reference for researchers and investigators graduate PhD and postgraduate students and end users interested in membrane science and technology nanomaterials eco friendly separation chemistry biology and process engineering

The Physical Chemistry of Materials Rolando Roque-Malherbe, 2016-04-19 In recent years the area dealing with the physical chemistry of materials has become an emerging discipline in materials science that emphasizes the study of materials for chemical sustainable energy and pollution abatement applications Written by an active researcher in this field Physical Chemistry of Materials Energy and Environmental Appl

Molecules in Interaction with Surfaces and Interfaces Reinhold Haberlandt, Dieter Michel, Andreas Pöppel, Ralf Stannarius, 2004-03-15 The study of the interaction of molecules with surfaces and interfaces is of great importance for the understanding of adsorption and catalysis on solid surfaces the complex properties of molecules on fluid interfaces and the relationship between structure and functionality in macromolecular biological systems It is the aim of this volume to present and analyse in a comprehensive and accessible way the methodical achievements and the recent progress in this field The broadness of both scope and selection of the topics should help in particular non expert readers to become familiar with this exciting field of research

MXenes

Yury Gogotsi, 2023-08-24 Since their discovery in 2011 MXenes 2D carbides nitrides and carbonitrides of early transition metals have developed into one of the largest and most intensively studied families of 2D materials They offer unique properties and are being explored in a large variety of applications This book compiles the most important research from a pioneer of the field Professor Yury Gogotsi and his interdisciplinary research team as well as numerous collaborators worldwide It reports on the discovery and rise of MXenes and describes their synthesis and processing properties and incorporation into polymer ceramic and metal matrices to produce composites It also discusses the potential of MXenes for use in energy storage optics electronics and sensing as well as biomedical environmental and electrocatalysis applications The book will appeal to anyone interested in nanomaterials and their synthesis properties and applications **Diffusive**

Spreading in Nature, Technology and Society Armin Bunde, Jürgen Caro, Christian Chmelik, Jörg Kärger, Gero Vogl, 2023-05-08 What do the movements of molecules and the migration of humans have in common How does the functionality of our brain tissue resemble the flow of traffic in New York City How can understanding the spread of ideas rumors and languages help us tackle the spread a pandemic This book provides an illuminating look into these seemingly disparate topics by exploring and expertly communicating the fundamental laws that govern the spreading and diffusion of objects A collection of leading scientists in disciplines as diverse as epidemiology linguistics mathematics and physics discuss various spreading phenomena relevant to their own fields revealing astonishing similarities and correlations between the objects of study be they people particles or pandemics This updated and expanded second edition of an award winning book introduces timely coverage of a subject with the greatest societal impact in recent memory the global fight against COVID 19 Winner of the 2019 Literature Prize of the German Chemical Industry Fund and brainchild of the international and long running Diffusion Fundamentals conference series this book targets an interdisciplinary readership featuring an introductory chapter that sets the stage for the topics discussed throughout Each chapter provides ample opportunity to whet the appetite of those readers seeking a more in depth treatment making the book also useful as supplementary reading in appropriate courses dealing with complex systems mass transfer and network theory **Numerical Analysis of Heat and Mass**

Transfer in Porous Media J.M.P.Q. Delgado, Antonio Gilson Barbosa Lima, Marta Vázquez da Silva, 2012-06-25 The purpose of Numerical Analysis of Heat and Mass Transfer in Porous Media is to provide a collection of recent contributions in the field of computational heat and mass transfer in porous media The main benefit of the book is that it discusses the majority of the topics related to numerical transport phenomenon in engineering including state of the art and applications and presents some of the most important theoretical and computational developments in porous media and transport phenomenon domain providing a self contained major reference that is appealing to both the scientists researchers and the engineers At the same time these topics encounter of a variety of scientific and engineering disciplines such as chemical civil agricultural mechanical engineering etc The book is divided in several chapters that intend to be a resume of the current state of

knowledge for benefit of professional colleagues

Separation Techniques in Analytical Chemistry Rudolf

Bock, Reinhard Nießner, 2023-07-24 The separation of a mixture into its individual components is one of the most fundamental procedures in analytical and industrial chemistry This classic book in analytical chemistry provides a comprehensive yet systematic outline of all known separation methods Through its detailed treatment of the basic principles of separation possibilities it not only covers what is currently known but also represents a treasure trove of methods that are still awaiting further development It is clearly structured and contains interesting examples further reading and a detailed index An indispensable book for advanced students of natural sciences chemistry biochemistry food chemistry pharmacy clinical chemistry environmental sciences and technology chemical engineering chemical physical measurement biotechnology as well as teachers of these disciplines

NanoBiosensing Huangxian Ju, Xueji Zhang, Joseph Wang, 2011-08-18 This book will cover the full scope of nanobiosensing which combines the newest research results in the cross disciplines of chemistry biology and materials science with biosensing and bioanalysis to develop novel detection principles sensing mechanisms and device engineering methods It not only covers the important types of nanomaterials for biosensing applications including carbon nanotubes carbon nanofiber quantum dots fullerenes fluorescent and biological molecules etc but also illustrates a wide range of sensing principles including electrochemical detection fluorescence chemiluminescence antibody antigen interactions and magnetic detection The book details novel developments in the methodology and devices of biosensing and bioanalysis combined with nanoscience and nanotechnology as well as their applications in biomedicine and environmental monitoring Furthermore the reported works on the application and biofunction of nanoparticles have attracted extensive attention and interest thus they are of particular interest to readers The reader will obtain a rich survey of nanobiosensing technology including the principles and application of biosensing the design and biofunctionalization of bionanomaterials as well as the methodology to develop biosensing devices and bioanalytical systems

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