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# **SURFACES OF NANOPARTICLES AND POROUS MATERIALS**



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# Surfaces Of Nanoparticles And Porous Materials

**Pascal Van Der Voort, Karen Leus, Els  
De Canck**



## **Surfaces Of Nanoparticles And Porous Materials:**

*Surfaces of Nanoparticles and Porous Materials* James A. Schwarz, Cristian I. Contescu, 1999-01-21 This innovative reference collects state of the art procedures for the construction and design of nanoparticles and porous material while suggesting appropriate areas of application Presenting both synthesis and characterization protocols *Surfaces of Nanoparticles and Porous Materials* contains over 3000 references tables equations drawings and photographs It examines the thermodynamics and kinetics of adsorption involving organic and inorganic liquids solids and gaseous media Topics include characterization transport processes diffusion and the adsorption of heavy metals ions proteins and pharmaceutical organics

**Introduction to Porous Materials** Pascal Van Der Voort, Karen Leus, Els De Canck, 2019-06-26 The first comprehensive textbook on the timely and rapidly developing topic of inorganic porous materials This is the first textbook to completely cover a broad range of inorganic porous materials It introduces the reader to the development of functional porous inorganic materials from the synthetic zeolites in the 50 s to today s hybrid materials such as metal organic frameworks MOFs covalent organic frameworks COFs and related networks It also provides the necessary background to understand how porous materials are organized characterized and applied in adsorption catalysis and many other domains Additionally the book explains characterization and application from the materials scientist viewpoint giving the reader a practical approach on the characterization and application of the respective materials *Introduction to Inorganic Porous Materials* begins by describing the basic concepts of porosity and the different types of pores surfaces and amorphous versus crystalline materials before introducing readers to nature s porous materials It then goes on to cover everything from adsorption and catalysis to amorphous materials such as silica to inorganic carbons and Periodic Mesoporous Organosilicas PMOs It discusses the synthesis and applications of MOFs and the broad family of COFs It concludes with a look at future prospects and emerging trends in the field The only complete book of its kind to cover the wide variety of inorganic and hybrid porous materials A comprehensive reference and outstanding tool for any course on inorganic porous materials heterogeneous catalysis and adsorption Gives students and investigators the opportunity to learn about porous materials how to characterize them and understand how they can be applied in different fields *Introduction to Inorganic Porous Materials* is an excellent book for students and professionals of inorganic chemistry and materials science with an interest in porous materials functional inorganic materials heterogeneous catalysis and adsorption and solid state characterization techniques

**Surface Science of Adsorbents and Nanoadsorbents** Tawfik Abdo Saleh, 2022-09-18 *Surface Science of Adsorbents and Nanoadsorbents* Volume 34 *Properties and Applications in Environmental Remediation* presents a unique collection of timely information on the surface science of adsorbents and nanoadsorbents The book offers a perfect source to document developments and innovations ranging from materials development and characterization of properties to applications that encompass the enhancement of sorption degradation processes and their usage for the removal of different pollutants

including heavy metals dyes and pesticides etc It is written for post graduate students scientists in academia and industry chemical engineers and water quality monitoring agencies working in water treatment efficient materials nanomaterials development and quality control Provides the theoretical and scientific foundation for understanding synthesis and applications in nano adsorbent material Presents numerous examples to help users gain an understanding of each subject Includes a variety of illustrations that further enhance the content

**Synthesis, Properties, and Applications of Oxide Nanomaterials** José A. Rodriguez, Marcos Fernández-García, 2007-03-30 Current oxide nanomaterials knowledge to draw from and build on Synthesis Properties and Applications of Oxide Nanomaterials summarizes the existing knowledge in oxide based materials research It gives researchers one comprehensive resource that consolidates general theoretical knowledge alongside practical applications Organized by topic for easy access this reference Covers the fundamental science synthesis characterization physicochemical properties and applications of oxide nanomaterials Explains the fundamental aspects quantum mechanical and thermodynamic that determine the behavior and growth mode of nanostructured oxides Examines synthetic procedures using top down and bottom up fabrication technologies involving liquid solid or gas solid transformations Discusses the sophisticated experimental techniques and state of the art theory used to characterize the structural and electronic properties of nanostructured oxides Describes applications such as sorbents sensors ceramic materials electrochemical and photochemical devices and catalysts for reducing environmental pollution transforming hydrocarbons and producing hydrogen With its combination of theory and real world applications plus extensive bibliographic references Synthesis Properties and Applications of Oxide Nanomaterials consolidates a wealth of current complex information in one volume for practicing chemists physicists and materials scientists and for engineers and researchers in government industry and academia It is also an outstanding reference for graduate students in chemistry chemical engineering physics and materials science

Surface Modification of Nanoparticle and Natural Fiber Fillers Vikas Mittal, 2015-07-06 A review of the various methodologies for the surface treatment of different types of inorganic spherical and fibrous fillers describing ball milling cationic polymerization vapor phase grafting plasma treatment and UV irradiation in detail In addition the book connects the resulting composite properties to the modified filler surface properties thus allowing for a purposeful application oriented composite design

Processing of Nanoparticle Materials and Nanostructured Films Kathy Lu, Chris Li, Eugene Medvedovski, Eugene A. Olevsky, 2010-10-01 There have been extraordinary developments in nanomaterials in the past two decades Nanomaterial processing is one of the key components for this success This volume titled Processing of Nanoparticle Materials and Nanostructured Films is a collection of the papers presented at Controlled Processing of Nanoparticle based Materials and Nanostructured Films symposium held during the Materials Science and Technology 2009 conference MS T 09 October 25 29 2009 in Pittsburgh PA It summarizes the progress that has been achieved most recently in understanding and processing nanoparticle based materials and

nanostructured films Nanoparticle based materials and nanostructured films hold great promise to enable a broad range of new applications This includes high energy conversion efficiency fuel cells smart materials high performance sensors and structural materials under extreme environments However many barriers still exist in understanding and controlling the processing of nanoparticle based materials and nanostructured films In particular agglomeration must be controlled in powder synthesis and processing to enable the fabrication of homogeneous green or composite microstructures and microstructure evolution must be controlled to preserve the size and properties of the nanostructures in the finished materials Also novel nanostructure designs are highly needed at all stages of bulk and thin film nanomaterial formation process to enable unique performances low cost and green engineering This volume focuses on three general topics 1 Processing to preserve and improve nanoscale size structure and properties 2 Novel design and understanding of new nanomaterials such as new synthesis approaches templating and 3D assembly technologies and 3 Applications of nanoparticle assemblies and composites and thin films

**Nanoparticle Technology Handbook** Makio Naito, Toyokazu Yokoyama, Kouhei Hosokawa, Kiyoshi Nogi, 2018-03-06 Nanoparticle Technology Handbook Third Edition is an updated and expanded authoritative reference providing both the theory behind nanoparticles and the practical applications of nanotechnology This third edition features twenty new chapters providing a reference much broader in scope than the previous edition Over 140 experts in nanotechnology and or particle technology contributed to this new edition The book not only includes the theory behind nanoparticles but also the practical applications of nanotechnology It examines future possibilities and new innovations and contains important knowledge on nanoparticle characterization and the effect of nanoparticles on the environment and humans Nanoparticle technology is a new and revolutionary technology which is increasingly used in electronic devices and nanomaterials It handles the preparation processing application and characterization of nanoparticles and has become the core of nanotechnology as an extension of conventional fine particle powder technology Nanoparticle technology plays an important role in the implementation of nanotechnology in many engineering and industrial fields including electronic devices advanced ceramics new batteries engineered catalysts functional paint and ink drug delivery system biotechnology etc making use of the unique properties of nanoparticles which are completely different from those of bulk materials Introduces all aspects of nanoparticle technology from the fundamentals to applications Cover basic information on preparation through to the characterization of nanoparticles in a systematic way Features information on nanostructures which play an important role in practical applications Includes the effects of nanoparticles on human health and the environment Includes applications of nanoparticles in diverse fields including applications in new areas such as electronics cosmetics etc Offers up to date information given by specialists in each field

**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 artificing 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 [Colloid and Interface Chemistry for Nanotechnology](#) Peter Kralchevsky,Reinhard Miller,Francesca Ravera,2016-04-19 Colloid and interface science dealt with nanoscale objects for nearly a century before the term nanotechnology was coined An interdisciplinary field it bridges the macroscopic world and the small world of atoms and molecules Colloid and Interface Chemistry for Nanotechnology is a collection of manuscripts reflecting the activities of research te *Advanced Functional Porous Materials* Arya Uthaman,Sabu Thomas,Tianduo Li,Hanna Maria,2021-11-13 This book presents synthesis characterization and applications of macroporous mesoporous nanoporous hierarchical porous porous metals and porous ceramics Special emphasis is given to the preparation of porous activated carbon materials and porous ionic liquid derived materials for CO2 emissions mitigation Additionally a chapter includes the physical and mathematical modeling in porous media Many analytical techniques for characterization are discussed in this book Also the biomedical and industrial applications of porous materials in adsorption catalysis biosensors drug delivery nanotechnology are described The content helps solving fundamental and applied problems in porous materials with length scales varying from macro to nano level

**Nanoparticle Technology Handbook** Kiyoshi Nogi,Makio Naito,Toyokazu Yokoyama,2012-04-13 This handbook explains aspects of nanoparticles with many application examples showing their advantages and advanced development

[Nano-Strategies for Addressing Antimicrobial Resistance](#) Vinay Kumar,Varsha Shriram,Ravi Shukla,Suresh Gosavi,2022-12-18 Antibiotics the backbone of modern clinical medicine are facing serious challenges from emerging antimicrobial resistance AMR a complicated phenomenon expanding in bacterial species from nosocomial to community

origins where microbes are no longer sensitive to a range of commonly used antibiotics AMR has exploded in recent years and is posing a serious threat to human health and survival This necessitates novel and effective ways of diagnosis drug delivery and treatment nanotechnology and advanced nanomaterials are hailed as a potent solution in containing AMR The main thrust of this volume is to explain the most current research on the central theme of potential use of nano approaches for diagnosis detection drug delivery and as antimicrobial agents against drug resistant pathogenic microbes This book provides an integrated blend of basic and advanced information for students scholars scientists and practitioners interested or already engaged in research in these areas We have brought together leading international authors to present and highlight various aspects of nanotechnology in combating AMR in WHO prioritized microbes Topics range from advances in nanomaterial synthesis characterization functionalization and improvisation as well as applications in sensing diagnosis of AMR and their therapeutic and drug delivery potential against MDR and XDR microbial phenotypes

**Rational Design of Next-generation Nanomaterials and Nanodevices for Water Applications** Peng Wang, 2016-08-15 Despite the fact that nanotechnology has been present for a few decades there is a big gap between how nanotechnology is perceived and what nanotechnology can truly offer in all sectors of water The question to be answered is what more can we expect from nanotechnology in the water field The rational nano design starts with well defined problem definitions necessitates interdisciplinary approaches involves think outside the box and represents the future growth point of environmental nanotechnology However it is still largely new to the educated public and even scientists and engineers in water fields Therefore it is the purpose of this book to promote the concept of rational nano design and to demonstrate its creativity innovation and excitement This book presents a series of carefully selected rationally designed nano materials devices surfaces which represent drastically different ground breaking and eye opening approaches to conventional problems to embody the concept of nano design and to illustrate its remarkable potential to change the face of the research in water industry in the future Each of the book contributors is world renowned expert in the burgeoning field of rational nano design for applications Rational Design of Next generation Nanomaterials and Nanodevices for Water Applications is intended for undergraduates graduates scientists and professionals in the fields of environmental science material science chemistry and chemistry engineering It provides coherent and good material for teaching research and professional reference Contents Introduction to rational nano design for water applications Rational design of smart materials surfaces with switchable oil wettability for sustainable oil spill cleanup Rational design of three dimensional macroscale porous electrodes for bioelectrochemical systems Design of photo electrochemical active membranes as next generation filtration devices Hierarchical materials as a design concept for multifunctional membranes Rational design of functional nanoporous materials to confine water pollutant in controlled nano space A next generation forward osmosis draw solution design Rational design of magnetic permanently confined micelle arrays Mag PCMA materials for sustainable water and soil remediation Rational

design of an all in one lab on chip device for direct seawater desalination Design of micro sized microbial fuel cells as miniature energy harvesters Author Peng Wang King Abdullah University of Science and Technology **Environmental Applications of Carbon Nanomaterials-Based Devices** Shadpour Mallakpour, Chaudery M. Hussain, 2021-09-17 Environmental Applications of Carbon Nanomaterials Based Devices Explore this insightful treatment of the function and fabrication of high performance devices for environmental applications Environmental Applications of Carbon Nanomaterials Based Devices delivers an overview of state of the art technology in functionalized carbon nanomaterials based devices for environmental applications The book provides a powerful foundation based in materials science on functionalized carbon nanomaterials in general and environmental science and device fabrication in particular The book focuses on the chemical and physical methods of functionalization of carbon nanomaterials and the technology of device fabrication including lab on a chip approaches and applications such as wastewater purification and gas sensing It provides readers with a thorough understanding of effective environmental remediation techniques performed with carbon nanomaterials based devices In addition to topics such as cross linked graphene oxide membranes assembled with graphene oxide nanosheets free standing graphene oxide chitin nanocrystal composite membranes for dye adsorption and oil water separation and in situ grown covalent organic framework nanosheets on graphene for membrane based dye salt separation readers will also benefit from the inclusion of A thorough introduction to charge gated ion transport through polyelectrolyte intercalated amine reduced graphene oxide membranes An exploration of hydrotalcite graphene oxide hybrid nanosheets functionalized nanofiltration membrane for desalination A discussion of the incorporation of attapulgite nanorods into graphene oxide nanofiltration membranes for efficient dyes wastewater treatment An examination of attapulgite nanofibers and graphene oxide composite membranes for high performance molecular separation Perfect for materials scientists analytical chemists and environmental chemists Environmental Applications of Carbon Nanomaterials Based Devices will also earn a place in the libraries of sensor developers seeking a one stop resource for high performance devices and sensors useful for environmental applications

**Innovations in Engineered Porous Materials for Energy Generation and Storage Applications** Ranjusha Rajagopalan, Avinash Balakrishnan, 2018-04-27 Making innovative products for energy generation that decrease carbon footprints are the need of the hour This book describes innovations in porous materials for energy generation and storage applications that can have applications in developed as well as developing countries It provides a comprehensive account of porous materials for potential new applications such as catalysts for gas storage and energy efficient transformations which engineers and scientists working in the areas of solar cells batteries supercapacitors fuel cells etc will find to be of immense interest **Silver Nanoparticles** Khan Maaz, 2018 Silver nanoparticles are the subject of immense interest because of their distinct chemical and physical properties that are different from their bulk counterpart This makes these nanoparticles very important in many fields including antimicrobial applications biosensor materials composite fibers cryogenic



superconducting materials cosmetic products and electronic components This book aims to provide in depth study and analysis of various fabrication characterization and application techniques of silver nanoparticles that lead these nanoparticles very important in the recent technology This book presents deep understanding of the new techniques from basic to the advanced level This book addresses scientists engineers doctoral and postdoctoral fellows and technical professionals working in specialized fields

**Essentials in Nanoscience and Nanotechnology** Narendra Kumar, Sunita Kumbhat, 2016-04-11 This book describes various aspects of nanoscience and nanotechnology It begins with an introduction to nanoscience and nanotechnology and includes a historical prospective nanotechnology working in nature man made nanomaterial and impact of nanotechnology illustrated with examples It goes on to describes general synthetic approaches and strategies and also deals with the characterization of nanomaterial using modern tools and techniques to give basic understanding to those interested in learning this emerging area It then deals with different kinds of nanomaterial such as inorganics carbon based nanocomposites and self assembled supramolecular nano structures in terms of their varieties synthesis properties etc In addition it contains chapters devoted to unique properties with mathematical treatment wherever applicable and the novel applications dealing with information technology pollution control environment water energy nanomedicine healthcare consumer goods etc

Polymer Surfaces in Motion Juan Rodríguez-Hernández, Carlos Drummond, 2015-08-03 Pattern formation is a fascinating and challenging aspect in polymer science This book describes a number of unconventional approaches developed to control the morphology of polymer surfaces and materials from random or simple patterns to complex structures Specialists provide an up to date and complete overview of each technique in their respective field

*Sustainability, Safety, and Applications of Nanomaterials-Based Corrosion Inhibitors* Thakur, Abhinay, Kumar, Ashish, 2024-07-18 In an era defined by the imperatives of sustainability and technological innovation the quest for effective corrosion prevention solutions has assumed unprecedented significance Against the backdrop of global challenges such as climate change aging infrastructure and resource depletion nanomaterials based corrosion inhibitors offer a promising pathway towards enhancing the durability safety and environmental sustainability of critical systems Sustainability Safety and Applications of Nanomaterials Based Corrosion Inhibitors contextualizes the relevance of nanotechnology in addressing these pressing concerns highlighting its role in advancing sustainable development goals and fostering resilience in the face of corrosion related challenges It discusses how nanotechnology can revolutionize corrosion inhibition strategies for the sustainable development of infrastructure in the 21st century Covering topics such as coating techniques space exploration and aerospace engineering this book is a useful resource for engineers scientists researchers industry professionals business owners and academicians

**Nanoporous Materials** Qiang Xu, 2013-01-04 In the past two decades the field of nanoporous materials has undergone significant developments As these materials possess high specific surface areas well defined pore sizes and functional sites they show a great diversity of applications such as molecular

adsorption storage and separation sensing catalysis energy storage and conversion drug delivery and more Nanoporous Materials Synthesis and Applications surveys the key developments in the synthesis of nanoporous materials in a broad range from soft porous materials such as porous organic and metal organic frameworks to hard porous materials such as porous metals and metal oxides and the significant advances in their applications to date Topics Include Synthetic approaches characterization techniques and applications of a variety of meso and microporous polymers and organic frameworks Advances in the synthetic control of structures along with the function exploration of this new class of organic porous materials Synthesis and applications of nanoporous metal organic frameworks mesoporous silica and nanoporous glass Synthesis of mesoporous carbons by a soft and hard templating method and their applications for supercapacitors and membrane separations Fabrication of nanoporous semiconductor materials Structural modification and functional improvement of layered zeolites Germanates and related materials with open frameworks

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