

SMART MEMBRANES AND SENSORS

Synthesis, Characterization, and Applications



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Smart Membranes And Sensors Synthesis Characterization And Applications

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Sachdeva,Pradeep Kumar Sharma**



Smart Membranes And Sensors Synthesis Characterization And Applications:

Smart Membranes and Sensors Annarosa Gugliuzza, 2014-09-19 This book addresses the reader to use synergistically the concepts of membranes and sensors materials. It contains insightful contributions from leading scientists working in both the fields. The focus is on the fabrication of smart membranes from sensor materials and related impact on many technologically sophisticated areas such as telemedicine, microfluidics, drug delivery, targeting, bio separation, labs on a chip, textiles, power storage and release, environment monitoring, agro food safety, cosmetics, architecture, automotive and so on. This book covers various topics including the choice of materials and techniques for assembling responsive membranes with ability to transport mass, energy and signals on demand. The reader will find through the book an extensive description of the best techniques used to monitor molecular scale events which are regarded as responsible for the smartness of multifunctional objects and for the conversion of chemical signals into optical, electrical, thermal and mechanical responses. The reader is encouraged to use this cross disciplinary discussion for his own research. Chemical, biological and physical concepts expressed through the book contribute to form a common language which will allow the reader to discover causes for reflection and innovation, measuring how smart objects with desired properties can be tailored from existing materials and used flexibly for different developed applications. Specifically, This book deals with materials smartness and suitable techniques to assemble and characterize them in sensor like membranes. This book shows how ultra smart functional devices can be accomplished by using traditional raw materials. This book describes particular key events which control sense to react and adapt mechanisms. The potential of sensor like membranes in some key strategic fields is examined with particular emphasis on biomedicine, food and textiles markets. The benefits arising from the use of smart membranes are analysed in terms of life quality, safety and innovation.

Smart Materials for Waste Water Applications Ajay Kumar Mishra, 2016-01-29 Smart materials are used to develop more cost effective and high performance water treatment systems as well as instant and continuous ways to monitor water quality. Smart materials in water research have been extensively utilized for the treatment, remediation and pollution prevention. Smart materials can maintain the long term water quality, availability and viability of water resource. Thus water via smart materials can be reused, recycled, desalinized and also it can detect the biological and chemical contamination whether the source is from municipal, industrial or man made waste. The 15 state of the art review chapters contained in this book cover the recent advancements in the area of waste water as well as the prospects about the future research and development of smart materials for the waste water applications in the municipal, industrial and manmade waste areas. Treatment techniques: nanofiltration, ultrafiltration, reverse osmosis, adsorption and nano reactive membranes are also covered in depth. The chapters are divided into three groups. The first section includes the various carbon nanomaterials such as carbon nanotubes, mixed oxides with a focus on use of carbon at nanoscale applied for waste water research. The second section focuses on synthetic nanomaterials for pollutants removal. The third section

highlights the bio polymeric nanomaterials where the authors have used the natural polymers matrices in a composite and nanocomposite material for waste treatment The large number of researchers working in the area will benefit from the fundamental concepts advanced approaches and application of the various smart materials towards waste water treatment that are described in the book It will also provide a platform for the researchers and graduate students to carry out advanced research and understand the building blocks

Porous Membranes Annarosa Gugliuzza,Wanqin Jin,2025-06-25 The book is essential for anyone seeking a deep understanding of porous membranes as it offers valuable insights into manufacturing methods innovative applications and strategies for optimizing membrane design to meet critical project demands across various fields Porous Membranes Breakthroughs in Manufacturing and Applications is a comprehensive guide to discovering the world of porous membranes and their applications This volume gives a global perspective of basic concepts featuring manufacturing approaches and potential applications where control of pore size and shape and distribution can be decisive for the success of a membrane process In depth explanations elaborate on the key role assigned to a membrane s pores in directing events that are crucial for the mandatory targets imposed by a project s requirements Further discussions on how to manage and characterize materials from a molecular to macro scale to achieve highly defined architecture to enable high performing separations are explored Advances and innovation are central themes providing useful solutions to current critical aspects and existing bottlenecks in the control of structural and chemical features of targeted membranes This cross disciplinary discussion opens new routes for membrane science in expanding fields including water management environmental remediation recovery of targeted compounds food and health Readers will find this book Introduces the strict relationship between extensively ordered porous membranes and enhanced productivity Explores new approaches based on new membrane pore concepts Emphasizes the feasibility and reliability of the proposed techniques within the context of a potential scale up analyzing critical issues and traits Focuses on the role of porous membranes in some strategic membrane operations providing clear evidence about the fundamental role of structure separation properties for the success of membrane processes dedicated to natural resource management Audience Researchers in chemistry biology biomedicine materials science textiles and electronics who are involved with membranes and materials technologists and product managers from industry including those responsible for research and development building prototypes and commercial devices will find this book to be especially valuable

Imprinted Polymeric Membranes Laura Donato,2023-07-04 Higly efficient separation tools are increasingly required for satisfying the necessity of the modern society In this context for achieving optimized separation and purification of targeted compounds the typical features of the imprinting technology and membrane science for developing the so called imprinted membranes have been exploited Imprinted membranes are smart systems endowing selective recognition properties towards specific molecules and ions that exhibit better performance with respect to the traditional separation techniques The aim of this monography is to give a contribution in promoting the

knowledge on the current research trend about this topic Starting from the concept of the molecular recognition the book introduces the reader to the fascinating world of the imprinting technology and membrane based processes up to discussing the development of imprinted polymers as well as imprinted membranes which represent their special format The different imprinting strategies as well as the theory and mechanisms of the separation are also explained Furthermore the application of molecularly imprinted polymeric membranes in different areas for the selective recognition of drugs active pharmaceutical ingredients pesticides other toxic compounds and proteins is discussed The attention is also devoted to their employment in enantiomeric separation sensors technology and controlled drug delivery Finally the production and application of ion imprinted membranes in the separation of metal ions rare earth element and anions and the role of cyclodextrins in the imprinting technology are discussed

Fundamentals of Biophysics Andrey B. Rubin, 2014-09-11 Biophysics is a science that comprises theoretical plotting and models based on contemporary physicochemical conceptions They mirror physical specificity of the molecular organization and elementary processes in living organisms which in their turn form the molecular basis of biological phenomena Presentation of a complete course in biophysics requires vast biological material as well as additional involvement of state of the art concepts in physics chemistry and mathematics This is essential for the students to perceive the specific nature and peculiarity of molecular biological processes and see how this specificity is displayed in biological systems This is the essence of the up to date biophysical approach to the analysis of biological processes Fundamentals of Biophysics offers a complete thorough coverage of the material in a straightforward and no nonsense format offering a new and unique approach to the material that presents the appropriate topics without extraneous and unneeded filler material

Application of Nanotechnology in Membranes for Water Treatment Alberto Figoli, Jan Hoinkis, Sacide Alsoy Altinkaya, Jochen Bundschuh, 2017-07-14 The book focuses on Application of Nanotechnology in Membranes for Water Treatment but not only provides a series of innovative solutions for water reclamation through advanced membrane technology but also serves as a medium to promote international cooperation and networking for the development of advanced membrane technology for Universal well being and to achieve the common goal of supplying economically environmentally and societally sustainable freshwater and better sanitation systems This book is unique because the chapters were authored by established researchers all around the globe based on their recent research findings In addition this book provides a holistic coverage of membrane development for water treatment from the membrane preparation and characterizations to the performance for specific processes and applications Since that water scarcity has become a global risk and one of the most serious challenges for the scientific community in this century the publication of this book is therefore significant as it will serve as a medium for a good reference of an alternative solution in water reclamation This book will provide the readers with a thorough understanding of the different available approaches for manufacturing membranes both with innovative polymeric systems and inorganic nano materials which could give enhanced

functionalities catalytic and antimicrobial activities to improve the performance of the existing membranes It will be useful for leading decision and policy makers water sector representatives and administrators policy makers from the governments business leaders business houses in water treatment and engineers scientists from both industrialized and developing countries as well

Nanotechnology for Sustainable Water Resources Ajay Kumar Mishra, Chaudhery Mustansar Hussain, 2018-02-02 In this book we have summarized recent progresses due to novel nanomaterials for sustainable water resources Book provides a summary of the state of the art knowledge to scientists engineers and policy makers about recent developments due to nanotechnology for sustainable water resources arena The advances in sustainable water resources technologies in the context of modern society's interests will be considered preferably which allow to identify grand challenges and directions for future research The book contributors have been selected from all over the world and the essential functions of the nanotechnologies have presented rather than their anticipated applications Moreover up to date knowledge on economy toxicity and regulation related to nanotechnology are presented in detail In the end role of nanotechnology for green and sustainable future has also been briefly debated

Compendium of Biophysics Andrey B. Rubin, 2017-07-21 The most thorough coverage of biophysics available in a handy easy to read volume perfect as a reference for experienced engineers or as a textbook for the novice Following up on his first book Fundamentals of Biophysics the author a well known scientist in this area builds on that foundation by offering the biologist or scientist an advanced comprehensive coverage of biophysics Structuring the book into four major parts he thoroughly covers the biophysics of complex systems such as the kinetics and thermodynamic processes of biological systems in the first part The second part is dedicated to molecular biophysics such as biopolymers and proteins and the third part is on the biophysics of membrane processes The final part is on photobiological processes This ambitious work is a must have for the veteran biologist scientist or chemist working in this field and for the novice or student who is interested in learning about biophysics It is an emerging field becoming increasingly more important the more we learn about and develop the science No library on biophysics is complete without this text and its precursor both available from Wiley Scrivener

Smart Nanotechnology with Applications Cherry Bhargava, Amit Sachdeva, Pradeep Kumar Sharma, 2020-12-16 This comprehensive reference text discusses advance concepts and applications in the field of nanotechnology The text presents a detailed discussion of key important concepts including nanomaterials and nanodevices nano bio interface nanoscale memories and semiconductor nanotechnology It discusses applications of nanotechnology in the fields of aerospace engineering cosmetic industry pharmaceutical science food industry and the textile industry The text will be useful for senior undergraduate and graduate students in the field of electrical engineering electronics engineering nanotechnology and pharmaceutical science Discussing fundamental advanced concepts and their applications in a single volume this text will be useful as a reference text for senior undergraduate and graduate students in the field of electrical engineering electronics engineering nanotechnology and pharmaceutical science It

comprehensively discusses important concepts such as nano robotics carbon based nanomaterials and nanoscale memories The text discusses advanced concepts of nanotechnology and its applications in the fields of textile pharmaceutical sciences aerospace and food industry It will be an ideal reference text for senior undergraduate and graduate students in the field of electrical engineering electronics engineering nanotechnology and nanoscience

Seven Years of Membranes: Feature Paper 2017 Spas D. Kolev, 2018-08-09 This book is a printed edition of the Special Issue Seven Years of Membranes Feature Paper 2017 that was published in Membranes

Smart Nanosensors Imran Uddin, 2025-04-21 This book serves as a comprehensive compilation of contemporary research conducted in the domain of nanosensors The amalgamation of many elements within the emerging field contributes to the development of a useful collection specifically designed for inexperienced researchers in the domain of smart materials and nanosensor technologies An adequate range of subjects has been incorporated into the present book It includes enzyme mimetic use of smart nanomaterials for enhanced biosensing applications theranostic utilization of smart nanomaterials for targeted drug delivery sensors for pollutant detection and the utilization of smart nanomaterials in the development of biosensors for studying host microbe interactions Nanosensors have emerged as a promising avenue for various applications including sensing in the fields of medicine packaging and heavy metal ion detection Recent developments in the field of smart nanomaterials have led to significant advancements in the application of intelligent switches and sensors within the domains of agriculture food production and water treatment The primary emphasis of this book is the study of the synthesis and fabrication processes involved in the production of smart materials together with their application within the domain of sensor technology The existing body of literature has two main categories introductory textbooks that provide fundamental knowledge about the field and specialized publications that focus exclusively on certain subtopics within the domain of sensor technology The existing material of the book makes it a complete reference resource that is well suited for researchers in the area It especially caters to advanced graduate students who are seeking senior graduate MTech and MS degrees in the subject of sensor technology Additionally this publication would function as an essential resource for researchers across diverse disciplines within the area of materials science who are aiming to propel the development of smart materials

Biomedical Applications of Polymeric Materials and Composites Raju Francis, D. Sakthi Kumar, 2016-09-16 With its content taken from only the very latest results this is an extensive summary of the various polymeric materials used for biomedical applications Following an introduction listing various functional polymers including conductive biocompatible and conjugated polymers the book goes on to discuss different synthetic polymers that can be used for example as hydrogels biochemical sensors functional surfaces and natural degradable materials Throughout the focus is on applications with worked examples for training purposes as well as case studies included The whole is rounded off with a look at future trends

Advances in Analytical Techniques and Methodology for Chemical Speciation Study Ottavia Giuffrè, Carlos Rey-Castro, Anna Napoli, 2021-07-05

Smart Textiles

Nazire Deniz Yilmaz,2018-11-14 Smart Textiles Wearable Nanotechnology provides a comprehensive presentation of recent advancements in the area of smart nanotextiles giving specific importance to materials and production processes Different materials production routes performance characteristics application areas and functionalization mechanisms are covered The book provides a guideline to students researchers academicians and technologists who seek novel solutions in the related area by including groundbreaking advancements in different aspects of the diverse smart nanotextiles fields This groundbreaking book is expected to spark an inspiration to allow future progress in smart nanotextiles research The diversity of the topics as well as the expert subject matter contributors from all over the world representing various disciplines ensure comprehensiveness and a broad understanding of smart nanotextiles

Concise Encyclopedia of Biomedical Polymers and Polymeric Biomaterials Munmaya Mishra,2017-08-16 The Concise Encyclopedia of Biomedical Polymers and Polymeric Biomaterials presents new and selected content from the 11 volume Biomedical Polymers and Polymeric Biomaterials Encyclopedia The carefully culled content includes groundbreaking work from the earlier published work as well as exclusive online material added since its publication in print A diverse and global team of renowned scientists provide cutting edge information concerning polymers and polymeric biomaterials Acknowledging the evolving nature of the field the encyclopedia also features newly added content in areas such as tissue engineering tissue repair and reconstruction and biomimetic materials

Nanomaterials Design for Sensing Applications Olena V. Zenkina,2019-03-13 Nanomaterials Design for Sensing Applications examines chemosensors beginning with molecules that are able to respond to certain stimuli and then showing their assembly and incorporation into sensing materials The mechanisms of their action for the detection of ions specific molecules and biostructures are also covered A major theme is the affordability of sensors with particular attention paid to inexpensive and reliable colorimetric sensors that can be read by the naked eye The book also delves into the development of sensors that utilize existing RFID infrastructure and introduces a novel strategy for the development of self healing sensing platforms This book will help readers develop a better understanding of the types of materials used for sensing at the nano level while also providing an insightful overview on recent advances in this important area Demonstrates how the use of nanomaterials allows for the creation of cheaper more reliable sensors Shows how metal oxide nanostructures are used as both sensors and supports for embedded organic and organometallic sensing molecules Explores a novel sensing methodology resulting from the integration of nanostructured sensors into radio frequency identification tags

Properties and Applications of Superabsorbent Polymers Sand Arpit,Tuteja Jaya,2023-04-23 This book discusses fundamental aspects of super absorbent polymers SAPs insight into the synthesis and modification of SAPs as well as their potential applications in different domains SAPs are bio based material that has attracted much interest due to their unique structural properties biodegradability biocompatibility etc The book exhibits a unique combination of SAP designing synthetic strategies properties and chemistry along with SAP s application in the field of drug delivery firefighting and biosensors agriculture etc

Various approaches to make these products a cost effective and sustainable are discussed precisely in this book Additionally the approaches from the perspective of academic organization and research laboratories many readers are able to learn the insights of the connection between super absorbent polymers in the agriculture field by reducing seedling mortality owing to their water storage capacity in soil This book written by eminent researchers can be a useful reference for graduate post graduate students and researchers working in the file of super absorbent polymers polymer technology hygiene industry etc

Smart Nanomaterials for Sensor Application Songjun Li,Yi Ge,He Li,2012-03-31 There is considerable interest in reliable and affordable sensor and detection systems Recent concerns about environmental exposure to both biological and chemical agents have been critical to the development of new sensor and detector technologies New materials are being developed to meet the challenges ahead Smart nanomaterials appear to be a key solution to these challenges This e book summarizes current progress in sensor applications of smart nanomaterials It should be a useful resource for materials scientists and readers interested in nanotechnology for biosensors

Emerging Technologies in Wastewater Treatment Maulin P. Shah,2023-03-20 Emerging technologies in wastewater treatment plant is an ecological profitable and natural technology designed to eliminate heavy metals radionuclides xenobiotic compounds organic waste pesticides etc from contaminated sites or industrial downloads through biological means Since this technology is used in conditions on site it does not physically disturb the site unlike conventional methods that is chemical or mechanical methods In this technology higher plants or microbes are used alone or in combination for the phytoextraction of heavy metals from sites contaminated with metals Through microbial interventions metals are immobilized or mobilized through redox conversions in contaminated sites If they are mobilized accumulating metal plants are placed to accumulate metals in their bodies Next metal loaded plants are collected and recycled to reduce the volume of waste and then disposed of as hazardous materials or used for the recovery of precious metals if possible In case of immobilization metals are no longer available to be toxic to organisms There are very few books published on the proposed theme A good number of books have been published on environmental bioremediation but the proposed book is a new and an innovative proposal specifically in wastewater treatment Looking into the importance of emerging technologies in wastewater treatment research the book will have a high and applicable value in industrial wastewater treatment research Features The book highlights the importance of emerging technologies in the wastewater treatment plant to clean up the environment from pollution caused by human activities It assesses the potential application of several existing bioremediation techniques and introduces new emerging technologies It is an updated vision of the existing emerging technologies in environmental bioremediation strategies with their limitations and challenges and their potential application to remove environmental pollutants It also introduces the new trends and advances in environmental bioremediation with a thorough discussion of recent developments in this field Highlights the importance of bioremediation to deal with the ever increasing number of environmental pollutants

Nanosensors for Smart Cities

Baoguo Han,Vijay Tomer,Tuan Anh Nguyen,Ali Farmani,Pradeep Kumar Singh,2020-02-13 Nanosensors for Smart Cities covers the fundamental design concepts and emerging applications of nanosensors for the creation of smart city infrastructures Examples of major applications include logistics management where nanosensors could be used in active transport tracking devices for smart tracking and tracing and in agri food productions where nanosensors are used in nanochips for identity and food inspection and smart storage This book is essential reading for researchers working in the field of advanced sensors technology smart city technology and nanotechnology and stakeholders involved in city management Nanomaterials based sensors nanosensors can offer many advantages over their microcounterparts including lower power consumption high sensitivity lower concentration of analytes and smaller interaction distance between object and sensor With the support of artificial intelligence AI tools such as fuzzy logic genetic algorithms neural networks and ambient intelligence sensor systems are becoming smarter Provides information on the fabrication and fundamental design concepts of nanosensors for intelligent systems Explores how nanosensors are being used to better monitor and maintain infrastructure services including street lighting traffic management and pollution control Assesses the challenges for creating nanomaterials enhanced sensors for mass market consumer products

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