

SMART MEMBRANES AND SENSORS

Synthesis, Characterization, and Applications



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Smart Membranes And Sensors Synthesis Characterization And Applications

Lingsheng Yao



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, desalinated 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

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

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

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, 2020-12-15 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

Synthesis, Characterization, and Applications of Graphitic Carbon Nitride Sabu Thomas, S. Anas, Jomon Joy, 2022-09-21 Synthesis Characterization and Applications of Graphitic Carbon Nitride An Uprising Carbonaceous Material offers an up to date record on the major findings and observations relating to graphitic carbon nitride based systems elaborately covering all the aspects of carbon nitride as chemical stable and pollution free materials that are easy to prepare in a cost effective way along with their applications in photocatalytic degradation of pollutants photocatalytic hydrogen generation carbon dioxide reduction disinfection sensors and supercapacitors Graphitic carbon nitride g C₃N₄ is a fascinating visible light photocatalyst which possesses many properties that can be used for many applications This makes

the book an indispensable reference for post graduate students researchers in academia and industry and engineers working in the field of graphitic carbon nitride based systems Includes the applications of graphitic carbon nitride as a photocatalyst for the reduction of CO₂ Describes the synthesis structure and properties of graphitic carbon nitride based systems Deals with the development of graphitic carbon nitride based nanocomposites Includes hydrogen production via water splitting by using graphitic carbon nitride Describes the applications of graphitic carbon nitride in the field of sensors solar cells fuel cells and in analytical chemistry

Recent Advancements in Computational Intelligence and Design Engineering
Dac-Nhuong Le, Abhishek Dhar, Ranjan Kumar, Saravanan Muthaiyah, Saurabh Adhikari, 2025-02-14 International Conference on Computational Intelligence and Design Engineering ICCIDE 2023 is a multidisciplinary conference focused on bringing together recent advancements in the field of engineering computer science and Mathematics The key features of the conference include a common platform for research and innovation work related to next generation computation Mathematics in computation as well as engineering research to achieve industry 5.0 mission The conference covers different aspects of science and technology like applications of AI and ML for sustainable manufacturing and production systems computational modelling mathematics and computing

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

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

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 ground breaking 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

2D Materials for Surface Plasmon Resonance-based Sensors Sanjeev Kumar Raghuwanshi, Santosh Kumar, Yadvendra Singh, 2021-12-12 2D Materials for Surface Plasmon Resonance based Sensors offers comprehensive coverage of recent design and development including processing and fabrication of 2D materials in the context of plasmonic based devices It provides a thorough overview of the basic principles and techniques used in the analysis and design of 2D material based optical sensor systems Beginning with the basic concepts of plasmon plasmonic sensors and mathematical modelling the authors explain the fundamental properties of 2D materials including Black Phosphorus BP Phosphorene Graphene Transition metal dichalcogenides TMDCs MXene s and SW CNT It also details the applications of these emerging materials in clinical diagnosis and their future trends This text will be useful for practising engineers undergraduate and postgraduate students Key Features Presents the fundamental concepts of 2D material assisted fibre optic and prism based SPR sensor in a student friendly manner Includes the recent synthesis and characterization techniques of 2D materials Provides computational results of recently discovered electronic and optical properties of the 2D materials along with their effectiveness in the field of plasmonic sensors Presents emerging applications of novel 2D material based plasmonic sensors in the field of chemical bio chemical and biosensing

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

Smart Ceramics Ajay Kumar Mishra, 2018-03-05 Recent advances in nanotechnology have paved the way for the development of new smart materials The term smart ceramics refers to ceramic materials fabricated from ultrafine particles They have attracted the attention of researchers and scientists thanks to their potential to manipulate the length scale in the nanorange leading to better and some unusual material properties Smart

ceramics ensure control of particle size surface contamination and degree of agglomeration They play a crucial role in challenging applications such as bone surgery e g the development of substitutes for load bearing bone parts and in biomedical science especially in tissue engineering dental applications and drug and antigen delivery using modified ceramics Porous nanostructured ceramics have potential use in both simple and complex applications such as bioimaging sensors paints and pigments optics and electronics because of their surface and size dependent properties For the synthesis of smart ceramics the sol gel route has been mainly utilized because of its ability to produce a large variety of compositions and to ensure homogeneous mixing of the constituent particles at low temperature This book describes the innovations in technologies through the development of functionalized ceramic materials for various applications It also describes recent and expected challenges along with their potential solutions in advanced techniques for the synthesis and characterization of nanostructured ceramics and their composites bioceramics bioactive ceramics multifunctional nanoceramics transparent ceramics nanocore shells nanowires thin films nanotubes and nanorods The applications include the environment health care electrochemical sensors high temperature superconductors nuclear reactor fuels electrical insulators refractory materials electrical transformers and magnetic core memory The book will benefit researchers scientists engineers and technologists working in the industry and in national and international research laboratories academics who are interested in traditional and advanced smart ceramic composites and students pursuing their postgraduate graduate and undergraduate degrees in smart ceramics nanomaterials nanoscience and engineering

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

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web 16 a periodic and repeating disturbance in a lake creates waves which emanate outward from its source to produce circular wave patterns if the frequency of the source is 2 00 hz and the wave speed is 5 00m s then the distance between adjacent wave crests is meter a 0 200

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