Applications Of Nanomaterials In Sensors And Diagnostics Springer Series On Chemical Sensors And Biosensors

Nanobiosensors
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Handbook of Nanomaterials in Analytical Chemistry
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Advances in Nanosensors for Biological and Environmental Analysis
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Molecular Imprinting for Nanosensors and Other Sensing Applications
Nanofabrication for Smart Nanosensor Applications
Nanosensors
Physical, Chemical, and Biological
Molecular Sensors and Nanodevices
Nanomaterials Design for Sensing Applications

FITZPATRICK CARDENAS

Nanobiosensors Elsevier
Recent advances in nanotechnology has led the nanomaterials into the realm of sensing applications. This descriptive book utilizes a multi-disciplinary approach to provide extensive information about sensors and elucidates the impact of nanotechnology on development of chemical and biosensors for diversified applications. The main focus of this book is not only the inclusion of various research works, which have already been reported in literature, but also to make a potential conclusion about the mechanism behind this. This book will serve as an invaluable tool for both frontline researchers and academicians to work towards the future development of nanotechnology in sensing devices.
Nanomaterials-Based Electrochemical Sensors: Properties, Applications and Recent Advances Elsevier
This book discusses novel nanomaterials and their various aspects. Chapters provide detailed information on new preparation routes for novel nanomaterials and their applications in supercapacitors, nanogenerators, removal of industrial pollutants, biosensors, self-cleaning coatings, aquatic robotics, and the construction industry.

Handbook of Nanomaterials in Analytical Chemistry Springer Science & Business Media
Nano-scale materials are proving attractive for a new generation of devices, due to their unique properties. They are used to create fast-responding sensors with good sensitivity and selectivity for the detection of chemical species and biological agents. Nanosensors for Chemical and Biological Applications provides an overview of developments brought about by the application of nanotechnology for both chemical and biological sensor development. Part one addresses electrochemical nanosensors and their applications for enhanced biomedical sensing, including blood glucose and trace metal ion analysis. Part two goes on to discuss spectrographic nanosensors, with chapters on the use of nanoparticle sensors for biochemical and environmental sensing and other techniques for detecting nanoparticles in the environment. Nanosensors for Chemical and Biological Applications serves as a standard reference for R&D managers in a range of industrial sectors, including nanotechnology, electronics, biotechnology, magnetic and optical materials, and sensors technology, as well as researchers and academics with an interest in these fields. Reviews the range electrochemical nanosensors, including the use of carbon nanotubes, glucose nanosensors, chemiresistor sensors using metal oxides, and nanoparticles

Discusses spectrographic nanosensors, such as surface-enhanced Raman scattering (SERS) nanoparticle sensors, the use of coated gold nanoparticles, and semiconductor quantum dots

Biosensors Springer Science & Business Media

This textbook is intended to serve as a reference guide to the interdisciplinary fields of nanomaterials, sensors and biotechnology. It demonstrates functional applications of nanotechnology in diverse areas such as environmental sensing and space habitation, to medical diagnostics and tissue regeneration. With a focus on novel materials synthesis, such as using the nanomanufacturing technique of electrospinning to get the longest nanowires possible, a correlation is made of the effect of chemical, structural, and morphological features to achieve extreme materials functionality. This publication will serve as a manual to nanotechnology for both novices and experts alike, and from the materials scientist to the biophysicist and bioengineer and the medical scientist.

Synthesis, Integration and Applications Pan Stanford Publishing

Molecular Imprinting for Nanosensors and Other Sensing Applications provides fundamental knowledge on molecular imprinting, including types, preparation methods, properties and characterization techniques. The book also covers the state-of-the-art technological developments of sensors that incorporate with microfluidic systems, lab-on-a-chip-tools, and other techniques. Sections discuss the integration of molecularly imprinted polymers with current top-notch tools and platforms that facilitate their potential applications in the realms of medicine, pharmaceuticals and environmental monitoring. Topics of note include molecularly imprinted polymer-based sensor models, their functionalization methodologies, prominent characteristics, and their characterization tools. Covers, in an in-depth manner, molecular imprinting as it relates to nanosensors Provides an appropriate resource on the various applications of imprinted sensors, such as their use in the environment, medicine and food industry Includes future outlooks and expectations for sensor technology

Nanosensors for Chemical and Biological Applications Elsevier

Sensors are effective tools used to carry out cost-effective, fast, and reliable sensing for a wide range of applications. This volume presents a brief history behind sensing technology and highlights a broad range of biosensing techniques based on optical and electrochemical response methods. Starting from the traditional enzyme-based biosensing method to functionalized nanostructure-based sensors, this book also provides a detailed overview of some of the advanced sensing methodologies based on photonic crystal cavity-based sensing devices. The authors showcase the extraordinary success of nanomaterials, their current strategical exploitation, and an unprecedented pool of possibilities they hold for the future. Many of the technologies have been developed recently for the sensing of various bioanalytes and molecules, some of which have been included in this book through dedicated chapters. The book looks at various sensors, such as for biosensing, electrochemical sensing, gas sensing, photoelectrochemical sensing, and colorimetric sensing, all of which have shown vast potential.

Advanced Nanomaterials CRC Press
Nowadays, the implementation of novel technological platforms in biosensor-based developments is primarily directed to the miniaturization of analytical systems and lowering the limits of detection. Rapid scientific and technological progress enables the application of biosensors for the online detection of minute concentrations of different chemical compounds in a wide selection of matrixes and monitoring extremely low levels of biomarkers even in living organisms and individual cells. This book, including 16 chapters, characterizes the present state of the art and prospective options for micro and nanoscale activities in biosensors construction and applications.
Metal Oxide Nanomaterials for Chemical Sensors Springer
Environmental devices help in monitoring the collection of one or more measurements that are used to access the status of an environment. Today, environmental monitoring and analytical methods are among the most rapidly developing branches of analysis. The functionalization of nanomaterials in the field of environmental science has increasing importance with regards to the fabrication of devices. Functionalized nanomaterials reformulate new materials and advanced characteristics for improved application in comparison to old fashion materials and open an opportunity for the development of devices for introducing new technology and techniques for monitoring environmental challenges. The monitoring of these environmental challenges in advances have direct impact on health and sustainability. Functionalized nanomaterials have different mechanical, absorption, optical or electrical properties than original nanomaterials. In fact, major utilization of nanomaterials occurs in their functionalized forms, which are very different from the parent material. This handbook provides an overview of the different state-of-the-art materials, devices and environmental applications of functionalized nanomaterials. In addition, the information offers a platform for ongoing research in the field of environmental science and device fabrication. The main objective of this book is to cover the major areas focusing on the functionalization of nanomaterials, device fabrication along with different techniques and environmental applications of functionalized nanomaterials-based devices. This is an important reference source for materials scientists, engineers and environmental scientsts who are looking to increase their understanding of how functionalized nanomaterial-based devices are being used for environmental monitoring applications. Helps the reader to understand the basic principles of functionalization of nanomaterials Highlights fabrication and characterization methods for functionalized nanomaterials-based environmental monitoring devices Assesses the major challenges of creating devices using functionalized nanomaterials on a mass scale
Electrochemical Biosensors John Wiley & Sons
Application of Nanomaterials in Chemical Sensors and BiosensorsCRC Press
Emerging Research Trends in Devices and Applications Taylor & Francis
Carbon Nanomaterials-Based Sensors: Emerging Research Trends in Devices and Applications covers the most recent research and design trends for carbon nanomaterials-based sensors for a

variety of applications, including clinical and environmental uses, and more. Carbon nanomaterials-based sensors can be used with high sensitivity, stability and accuracy compared to other techniques. Written by experts in their given fields from around the world, this book helps researchers solve the particular challenges they face when developing new types of sensors. It instructs how to make sensitive, selective, robust, fast-response and stable carbon nanomaterial-based sensors, as well as how to utilize them in real life. Covers the environmental monitoring and analytical implications of electro-analytical methods, one of the most dynamically developing branches of carbon nanomaterials Includes a complete discussion of functionalized nanostructure materials reformulated with noble materials and advanced characteristics for improved applications when compared to standard materials Covers sustainability and challenges in the commercialization of carbon nanomaterials-based sensors

Principles, Designs and Applications in Biomedical Engineering Application of Nanomaterials in Chemical Sensors and Biosensors

Advanced Nanomaterials for Inexpensive Gas Microsensors presents full coverage of the area of gas sensing nanomaterials, from materials, transducers and applications to the latest advanced results and future directions. A number of experts in the field present work on gas sensing nanomaterials including metal oxides, carbon based and hybrid materials, together with their fabrication and application. The book brings together three major themes: Several chapters address synthesis, functionalization, characterization of advanced nanomaterials, with emphasis on synthesis techniques to ease the integration of nanomaterials in transducers. These chapters encompass a wide spectrum of sensing technologies including advanced nanomaterials such as metal oxides, carbon materials and graphene, organic molecular materials, and atomic layers such as MoS2. The authors examine the coupling of sensitive nanomaterials to different types of transducer elements and their applications, including direct growth and additive fabrication techniques as a way to obtain inexpensive gas microsensors, principal transduction schemes, and advanced operating methods. Assess the value of major applications for gas microsensors, including air quality monitoring both indoors (buildings and vehicles) and outdoors, monitoring perishable goods and medical. For each application, potential issues are clearly identified, research directions to overcome these are suggested, and market analysis data is included. Advanced Nanomaterials for Inexpensive Gas Microsensors presents the latest research and most comprehensive coverage in the field of gas micro and nano sensors for research scientists, academics, graduate students, and R&D managers working on synthesis of nanomaterials and fabrication of sensing systems, in a wide range of areas in electrical and material engineering, physical chemistry, electrochemistry and physics. Presents technological solutions and applications of gas sensors in varied areas of chemistry, physics, material science, and engineering Examines advanced operating methods (e.g., temperature modulation, self-heating, light-activated response, noise methods) to enhance stability, sensitivity, selectivity and reduce power

consumption Provides a critical review of current applications and their expected future evolution, demonstrating which are the most promising approaches and what can be expected from the development of inexpensive gas micro- and nanosensors

Nanomaterials-Based Sensing Platforms
Elsevier

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

Nanomaterials for Security
Woodhead Publishing

A large part of the advances in nanotechnology have been directed towards the development of highspeed electronics, more efficient catalysts, and sensors. This latter group of applications has great relevance and unprecedented development potential for the coming years. Some of the main objectives for the development of sensors have focused on making more sensitive, effective and specific sensing devices. The improvement of these systems and the increase of specificity are clearly associated with a decrease in size of the components, which can lead to obtaining more rapid action, almost in real time. Nanomaterials currently used in sensor development include a long list of nanostructured systems, as for example: Metal nanotubes, nanowires, nanofibers, nanocomposites, nanorods, nanoparticles, nanostructured polymers, and different allotropes of carbon as carbon nanotubes, graphene or fullerenes, among others [1]. These nanomaterials are characterized by having unique physicochemical properties, including high electrical and thermal conductivity, extremely high surface area/volume ratio, high mechanical strength and even excellent catalytic properties [1] [2]. These materials, may exhibit relevant physicochemical behavior, such as quantization or electronic confinement effects, which can be used in the development of all kinds of sensors [2]. So far, sensors have been developed for determination and quantification of gases, radiation, biomolecules, microorganisms, etc. [2] [3]. The sensors developed so far usually use the system lock and key, wherein the selective receptor (lock) is selectively anchored to the analyte of interest (or key). This system has great limitations when analyzing the analyte in the presence of

other analytes, which can alter the sensitivity or specificity of the measure, as occurs in sensors used in biomedical applications [3] [4]. One possible solution is based on the development of sensor arrays, consisting of a combination of different and specific sensors, which may enable simultaneous measurements of one or more analytes in a less favorable environment [5] in these cases. These sensors are now a reality, although there is still a long way to go before the levels of precision and accuracy are reached. Future challenges for the development and commercialization of efficient sensors are mainly focused on improving the specificity, reproducibility, and the ability to detect trace levels. We hope that in the coming years nanotechnology and nanomaterials allow reaching previously unimaginable advances in the development of these systems.

Synthesis, Integration and Applications BoD – Books on Demand

Sensing and Biosensing with Optically Active Nanomaterials summarizes the potential sensing applications of optically (chromogenic and fluorogenic) active, nano-sized, organic, and inorganic materials for the selective detection of ionic analytes (such as metal ions and anions) in various environmental and biological samples. Sections cover design, synthesis, sensing mechanisms and applications for detecting ionic analytes. Each chapter deals with the sensing applications of one kind of nanomaterial. This book is an important reference source for materials scientists and engineers seeking to increase their understanding on how nanomaterials are being used for sensing applications. Provides information on the various types of optically active inorganic and organic nanomaterials, including quantum dots, SPR active noble metal nanoparticles, metal nanoclusters, organic nanoparticles and carbon dots Summarizes the synthesis, design and development of sensors, along with their mechanisms Explains major sensing applications and manufacturing challenges

Functionalized Nanomaterials Based Devices for Environmental Applications World Scientific

As opposed to conventional electrochemical sensors, nanomaterials-based sensors are active and effective in their action with even a minute concentration of analyte. A number of research studies are bringing about an evolution in their development and advancement because of their unique and effective properties. Nanoscale electrochemical sensors have applications in almost every field of life including the detection of neurochemicals, heavy metals, energy components, body fluids, biological matrices, cancer relevant biomolecules, aromatic hydrocarbons, also in playing their role in food science because of their capability in providing quality control and safety. There is a need to develop these nanomaterials-based electrochemical sensors to be more widely available for accurate sensing of minute concentrations especially in the case of heavy metal detection, biofluids, and other biomaterials. This book outlines the major preparation, fabrication and manufacture of nanomaterials-based electrochemical sensors, as well as detailing their principle medical, environmental and industrial applications in an effort to meet this need. This book is a valuable reference source for materials scientists, engineers, electrochemists,

environmental engineers and biomedical engineers who want to understand how nanomaterials-based electrochemical sensors are made, and how they are used. Explains the techniques used for the fabrication and manufacture of nanomaterials-based electrochemical sensors Discusses the major applications of nanomaterials-based electrochemical sensors in biomedicine and environmental science Assesses the potential toxicity and other challenges associated with using nanomaterials-based electrochemical sensors

Expanding the Vision of Sensor Materials Elsevier

Recent progress in the synthesis of nanomaterials and our fundamental understanding of their properties has led to significant advances in nanomaterial-based gas, chemical and biological sensors. Leading experts around the world highlight the latest findings on a wide range of nanomaterials including nanoparticles, quantum dots, carbon nanotubes, molecularly imprinted nanostructures or plastibodies, nanometals, DNA-based structures, smart nanomaterials, nanoprobes, magnetic nanomaterials, organic molecules like phthalocyanines and porphyrins, and the most amazing novel nanomaterial, called graphene. Various sensing techniques such as nanoscaled electrochemical detection, functional nanomaterial-amplified optical assays, colorimetry, fluorescence and electrochemiluminescence, as well as biomedical diagnosis applications, e.g. for cancer and bone disease, are thoroughly reviewed and explained in detail. This volume will provide an invaluable source of information for scientists working in the field of nanomaterial-based technology as well as for advanced students in analytical chemistry, biochemistry, electrochemistry, material science, micro- and nanotechnology.

Smart Nanomaterials for Sensor Application Elsevier

Nanosensors for Smart Manufacturing provides information on the fundamental design concepts and emerging applications of nanosensors in smart manufacturing processes. In smart production, if the products and machines are integrated, embedded, or equipped with sensors, the system can immediately collect the current operating parameters, predict the product quality, and then feed back the optimal parameters to machines in the production line. In this regard, smart sensors and their wireless networks are important components of smart manufacturing. Nanomaterials-based sensors (nanosensors) offer several advantages over their microscale counterparts, including lower power consumption, fast response time, high sensitivity, lower concentration of analytes, and smaller interaction distance between sensors and products. With the support of artificial intelligence (AI) tools such as fuzzy logic, genetic algorithms, neural networks, and ambient intelligence, sensor systems have become smarter. This is an important reference source for materials scientists and engineers who want to learn more about how nanoscale sensors can enhance smart manufacturing techniques and processes. Outlines the smart nanosensor classes used in manufacturing applications Shows how nanosensors are being used to make more efficient manufacturing systems Assesses the major obstacles to designing nanosensor-based manufacturing systems at an industrial scale

Environmental Applications of Nanomaterials Elsevier
Molecular Sensors and Nanodevices: Principles, Designs and Applications in Biomedical Engineering, Second Edition is designed to be used as a foundational text, aimed at graduates, advanced undergraduates, early-career engineers and clinicians. The book presents the essential principles of molecular sensors, including theories, fabrication techniques and reviews. In addition, important devices and recently, highly-cited research outcomes are also cited. This differentiates the book from other titles on the market whose primary focus is more research-oriented and aimed at more of a niche market. Covers the fundamental principles of device engineering and molecular sensing, sensor theories and applications in biomedical science and engineering Introduces nano/micro fabrication techniques, including MEMS, bioMEMS, microTAS and nanomaterials science that are essential in the miniaturization of versatile molecular sensors Explores applications of nanomaterials and biomaterials, including proteins, DNAs, nanoparticles, quantum dots, nanotubes/wires and graphene in biomedicine
Applications in Health Care Diagnostics John Wiley & Sons
Nanomaterials for Biosensors: Fundamentals and Applications provides a detailed summary of the main nanomaterials used in biosensing and their application. It covers recent developments in nanomaterials for the fabrication of biosensor devices for healthcare diagnostics, food freshness and bioprocessing. The various processes used for synthesis and characterization of nanostructured materials are examined, along with the design and fabrication of bioelectronic devices using nanostructured materials as building blocks. Users will find the fundamentals of the main nanomaterials used in biosensing, helping them visualize a systematic and coherent picture of how nanomaterials are used in biosensors. The book also addresses the role of bio-conjugation of nanomaterials in the construction of nano-biointerfaces for application in biosensors. Such applications, including metal nanoparticles, metal oxide nanoparticles, nanocomposites, carbon nanotubes, conducting polymers and plasmonic nanostructures in biosensing are discussed relative to each nanomaterial concerned. Finally, recent advancements in protein functionalized nanomaterials for cancer diagnostics and bio-imaging are also included. Provides a detailed study on how nanomaterials are used to enhance sensing capabilities in biosensors Explains the properties, characterization methods and preparation techniques of the nanomaterials used in biosensing Arranged in a material-by-material way, making it clear how each nanomaterial should be used
Nanomaterials for Sensor Applications
BoD – Books on Demand
Handbook of Nanomaterials for Intelligent Sensing Applications provides insights into the production of nanosensors and their applications. The book takes an interdisciplinary approach, showing how nano-enhanced sensing technology is being used in a variety of industry sectors and addressing related challenges surrounding the production, fabrication and application of nanomaterials-based sensors at both experimental and theoretical levels. This book is an important reference source for materials scientists and engineers

who want to learn more about how nanomaterials are being used to enhance sensing products and devices for a variety of industry sectors. The pof miniaturized device components and engineering systems of micro- and nanoscale is beyond the capability of conventional machine tools. The production of intelligent sensors at nanometer scale presents great challenges to engineers in design and manufacture. The manufacturing of nano-scaled devices and components involves isolation, transportation and re-assembly of atoms and molecules. This nanomachining technology involves not only physical-chemical processes as in the case of microfabrication, but it also involves application and integration of the principles of molecular biology. Explains how the functionalization of nanomaterials is being used to create more effective sensors Explores the major challenges of using nanoscale sensors for industrial applications on a broad scale Assesses which classes of nanomaterial should best be used for sensing applications