

Biosensors Nanotechnology Advanced Material Series

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Advanced Functional Materials - Ashutosh Tiwari 2015-05-08

Because of their unique properties (size, shape, and surface functions), functional materials are gaining significant attention in the areas of energy conversion and storage, sensing, electronics, photonics, and biomedicine. Within the chapters of this book written by well-known researchers, one will find the range of methods that have been developed for preparation and functionalization of organic, inorganic and hybrid structures which are the necessary building blocks for the architecture of various advanced functional materials. The book discusses these innovative methodologies and research strategies, as well as provides a comprehensive and detailed overview of the cutting-edge research on the processing, properties and technology developments of advanced functional materials and their applications. Specifically, **Advanced Functional Materials**: Compiles the objectives related to functional materials and provides detailed reviews of fundamentals, novel production methods, and frontiers of functional materials, including metallic oxides, conducting polymers, carbon nanotubes, discotic liquid crystalline dimers, calixarenes, crown ethers, chitosan and graphene. Discusses the production and characterization of these materials, while mentioning recent approaches developed as well as their uses and applications for sensitive chemiresistors, optical and electronic materials, solar hydrogen generation, supercapacitors, display and organic light-emitting diodes, functional adsorbents, and antimicrobial and biocompatible layer formation. This volume in the **Advanced Materials Book Series** includes twelve chapters divided into two main areas: Part 1: Functional Metal Oxides: Architecture, Design and Applications and Part 2: Multifunctional Hybrid Materials: Fundamentals and Frontiers

Advanced Materials for Agriculture, Food, and Environmental Safety - Ashutosh Tiwari 2014-08-19

The book focuses on the role of advanced materials in the food, water and environmental applications. The monitoring of harmful organisms and toxicants in water, food and beverages is mainly discussed in the respective chapters. The senior contributors write on the following topics: Layered double hydroxides and environment Corrosion resistance of aluminium alloys of silanes New generation material for the removal of arsenic from water Prediction and optimization of heavy clay products quality Enhancement of physical and mechanical properties of fiber Environment friendly acrylates latices Nanoparticles for trace analysis of toxins Recent development on gold nanomaterial as catalyst Nanosized metal oxide based adsorbents for heavy metal removal Phytosynthesized transition metal nanoparticles- novel functional agents for textiles Kinetics and equilibrium modeling Magnetic nanoparticles for heavy metal removal Potential applications of nanoparticles as antipathogens Gas barrier properties of biopolymer based nanocomposites: Application in food packing Application of zero-valent iron nanoparticles for environmental clean up Environmental application of novel TiO₂ nanoparticles

DNA Engineered Noble Metal Nanoparticles - Ignác Capek 2015-03-23

There is a growing interest in the use of nanoparticles modified with DNAs, viruses, peptides and proteins for the rational design of nanostructured functional materials and their use in biosensor applications. The challenge is to control the organization of biomolecules on nanoparticles while retaining their biological activity as potential chemical and gene therapeutics. These noble metal nanoparticles/biomolecules conjugates have specific properties and therefore they are attractive materials for nanotechnology in biochemistry and medicine. In this book, the author review work performed dealing

with the DNA structure and functionalities, interactions between DNA, noble metal nanoparticles, surface active agents, solvents and other additives. Particular attention is given to how the DNA's chain length and the DNA conformation affect the interaction and structure of the nanoconjugates and nanostructures that are formed. Also discussed are the recent advances in the preparation, characterization, and applications of noble metal nanoparticles that are conjugated with DNA aptamers and oligomers. The advantages and disadvantages of functionalized nanoparticles through various detection modes are highlighted, including colorimetry, fluorescence, electrochemistry, SPR, and, mass spectrometry for the detection of small molecules and biomolecules. The functionalized noble metal nanoparticles are selective and sensitive for the analytes, showing their great potential in biosensing. Furthermore, this book reviews recent progress in the area of DNA-noble metal nanoparticles based artificial nanostructures, that is, the preparation, collective properties, and applications of various DNA-based nanostructures are also described.

Advanced Food Analysis Tools - Rovina Kobun 2020-09-18

Advanced Food Analysis Tools: Biosensors and Nanotechnology provides the latest information on innovative biosensors and tools that are used to perform on-site detection tests. Food safety is a global health goal, with the food industry providing testing and guidance to keep the population safe. Food contamination is mainly caused by harmful substances and biological organisms, including bacteria, viruses and parasites, which can all have a major impact on human health. The lack of specific, low-cost, rapid, sensitive and easy detection of harmful compounds has resulted in the development of the electrochemical technologies that are presented in this book. Includes the most recent and innovative biosensor and nanotechnology for the food industry Applies the most current trends in food analysis research Presents opportunities for unique electrochemical tools to enhance performance

Green and Sustainable Advanced Materials - Shakeel Ahmed 2018-10-02

Sustainable development is a very prevalent concept of modern society. This concept has appeared as a critical force in combining a special focus on development and growth by maintaining a balance of using human resources and the ecosystem in which we are living. The development of new and advanced materials is one of the powerful examples in establishing this concept. Green and sustainable advanced materials are the newly synthesized material or existing modified material having superior and special properties. These fulfil today's growing demand for equipment, machines and devices with better quality for an extensive range of applications in various sectors such as paper, biomedical, textile, and much more. Volume 1 gives overviews on a variety of topics of characterization of green and sustainable advanced materials including biopolymers, biocomposites, nanomaterials, polymeric materials, green functional textiles materials and hybrid materials, as well as processing chapters on the design and process aspects of nanofabrication.

Food Nanotechnology - David Julian McClements 2022-09-19

Nanotechnology is increasingly being utilized within the food industry to create innovative products with new or improved properties. This book introduces the history of nanotechnology applications in the food industry. It then discusses the key physicochemical and structural characteristics of the different kinds of nanoparticles found in foods, as well as showing how these characteristics lead to their unique functional attributes. Applications of nanotechnology in the food and agricultural industries are then covered,

including the creation of nanopesticides, nanofertilizers, nutrient delivery systems, functional ingredients, smart packaging materials, nanofilters, and sensors, as well as for the conversion of waste materials into value-added products. Finally, the potential toxicity of both organic and inorganic nanoparticles found in foods is critically assessed. The author is a Distinguished Professor of food science who uses physics, chemistry, and biology to improve the quality, safety, and healthiness of foods. He has published over 1200 scientific articles and 13 books in this area and is currently the most highly cited food scientist in the world. He has won numerous awards for his scientific achievements. The aim of this book is to provide scientists and technologists with an understanding of the basic principles of nanotechnology and how they can be used in the food and agricultural industry to improve the quality, sustainability, safety, and healthiness of our foods.

Nanostructured and Advanced Materials for Applications in Sensor, Optoelectronic and Photovoltaic Technology - Ashok K. Vaseashta 2007-04-29

The principal aim of this NATO Advanced Study Institute (ASI) "Nanostructured and Advanced Materials for Applications in Sensor, Optoelectronic and Photovoltaic Technology" was to present a contemporary overview of the field of nanostructured and advanced electronic materials. Nanotechnology is an emerging scientific field receiving significant worldwide attention. On a nanometer scale, materials or structures may possess new and unique physical properties. Some of these are now known to the scientific community, but there may well be many properties not yet known to us, rendering it as a fascinating area of research and a suitable subject for a NATO ASI. Yet another aspect of the field is the possibility for creating meta-stable phases with unconventional properties and the ultra-miniaturization of current devices, sensors, and machines. Such nanotechnological and related advanced materials have an extremely wide range of potential applications, viz. nanoscale electronics, sensors, optoelectronics, photonics, nano-biological systems, na- medicine, energy storage systems, etc. This is a wide-ranging subject area and therefore requires the formation of multi-disciplinary teams of physicists, chemists, materials scientists, engineers, molecular biologists, pharmacologists, and others to work together on the synthesis and processing of materials and structures, the understanding of their physical properties, the design and fabrication of devices, etc. Hence, in formulating our ASI, we adopted an int- disciplinary approach, bringing together recognised experts in the various fields while retaining a level of treatment accessible to those active in specific individual areas of research and development.

Advanced Electrode Materials - Ashutosh Tiwari 2016-11-09

This book covers the recent advances in electrode materials and their novel applications at the cross-section of advanced materials. The book is divided into two sections: State-of-the-art electrode materials; and engineering of applied electrode materials. The chapters deal with electrocatalysis for energy conversion in view of bionanotechnology; surfactant-free materials and polyoxometalates through the concepts of biosensors to renewable energy applications; mesoporous carbon, diamond, conducting polymers and tungsten oxide/conducting polymer-based electrodes and hybrid systems. Numerous approaches are reviewed for lithium batteries, fuel cells, the design and construction of anode for microbial fuel cells including phosphate polyanion electrodes, electrocatalytic materials, fuel cell reactions, conducting polymer based hybrid nanocomposites and advanced nanomaterials.

Green and Sustainable Advanced Materials, Volume 2 - Shakeel Ahmed 2018-10-30

Sustainable development is a very prevalent concept of modern society. This concept has appeared as a critical force in combining a special focus on development and growth by maintaining a balance of using human resources and the ecosystem in which we are living. The development of new and advanced materials is one of the powerful examples in establishing this concept. Green and sustainable advanced materials are the newly synthesized material or existing modified material having superior and special properties. These fulfil today's growing demand for equipment, machines and devices with better quality for an extensive range of applications in various sectors such as paper, biomedical, textile, and much more. Volume 2, provides chapters on the valorization of green and sustainable advanced materials from a biomedical perspective as well as the applications in textile technology, optoelectronics, energy materials systems, and the food and agriculture industry.

Advanced Healthcare Materials - Ashutosh Tiwari 2014-05-09

Advanced materials are attracting strong interest in the fundamental as well as applied sciences and are being extensively explored for their potential usage in a range of healthcare technological and biological applications. Advanced Healthcare Nanomaterials summarises the current status of knowledge in the fields of advanced materials for functional therapeutics, point-of-care diagnostics, translational materials, up and coming bio-engineering devices. The book highlights the key features which enable engineers to design stimuli-responsive smart nanoparticles, novel biomaterials, nano/micro-devices for diagnosis, therapy (theranostics). The leading contributor researchers cover the following topics: State-of-the-art of biomaterials for human health Micro- and nanoparticles and their application in biosensors The role of immunoassays Stimuli-responsive smart nanoparticles Diagnosis and treatment of cancer Advanced materials for biomedical application and drug delivery Nanoparticles for diagnosis and/or treatment of Alzheimer's disease Hierarchical modelling of elastic behavior of human dental tissue Biodegradable porous hydrogels Hydrogels in tissue engineering, drug delivery and wound care Modified natural zeolites Supramolecular hydrogels based on cyclodextrin poly(pseudo)rotaxane Polyhydroxyalkanoate-based biomaterials Biomimetic molecularly imprinted polymers The book is written for readers from diverse backgrounds across chemistry, physics, materials science and engineering, medical science, pharmacy, biotechnology, and biomedical engineering. It offers a comprehensive view of cutting-edge research on advanced materials for healthcare technology and applications.

Nanotechnology For Electronics, Photonics, Biosensors, And Emerging Technologies - Faquir C Jain 2020-08-04

This volume on Nanotechnology in Electronics, Photonics, Biosensors, and Emerging Technologies comprises research papers spanning from novel materials and devices, biosensors and bio-nano-systems, artificial intelligence, robotics and emerging technologies, to applications in each of these fields. These include blockchain improving security; ultra-sensitive Point of Care biosensor for detecting pathogenesis and detection of RNA-Virus infections; and advanced materials and devices such as ROM for anti-reverse engineering, FPGA bit-stream encryption, switching transients in memristors, and high-speed multi-bit logic and memories. Applications such as 3D-4D inkjet-printed wireless ultra-broadband modules for IOT, smart tag, and smart city applications are also included. In the area of material synthesis, carbon nanotube synthesis, III-nitride film growth via plasma-enhanced atomic layer deposition are noted. Threading dislocation behavior in InGaAs/GaAs (001) superlattice buffer layers brings a novel approach. Papers presented in this volume cover various aspects of high performance materials and devices for implementing high-speed electronic systems. This volume will serve as a useful reference for recent developments in nanotechnology.

Nanotechnology and Biosensors - Dimitrios P Nikolelis 2018-06-27

Nanotechnology and Biosensors shows how nanotechnology is used to create affordable, mass-produced, portable, small sized biosensors to directly monitor environmental pollutants. In addition, it provides information on their integration into components and systems for mass market applications in food analysis, environmental monitoring and health diagnostics. Nanotechnology has led to a dramatic improvement in the performance, sensitivity and selectivity of biosensors. As metal-oxide and carbon nanostructures, gold and magnetite nanoparticles, and the integration of dendrimers in biosensors using nanotechnology have contributed greatly in making biosensors more effective and affordable on a mass-market level, this book presents a timely resource on the topic. Highlights nanotechnology-based approaches to the detection of enzyme inhibitors, direct enzymatic and microbial detection of metabolites, and nutrients using biosensors. Includes examples on how nanotechnology has led to improvements in the construction of portable, selective and sensitive biosensing devices. Offers thorough coverage of biomarker/biosensor interaction for the rapid detection of toxicants and pollutants.

Advanced Theranostic Materials - Ashutosh Tiwari 2015-06-30

The present book covers the recent advances in the development on the regulation of such theragnosis system and their biomedical perspectives to act as a future nanomedicine. Advanced Theranostic Materials is written by a distinguished group of contributors and provides comprehensive coverage of the current literature, up-to-date overview of all aspects of advanced theranostics materials ranging from system biology, diagnostics, imaging, image-guided therapy, therapeutics, biosensors, and translational

medicine and personalized medicine, as well as the much broader task of covering most topics of biomedical research. The books focusses on the following topics: Part 1: System biology and translational medicine Aberrant Signaling Pathways: Hallmark of Cancer Cells and Target for Nanotherapeutics Application of Nanoparticles in Cancer Treatment Biomacromolecule-Gated Mesoporous Silica Drug Delivery Systems Construction of Functional DNA Nanostructures for Theranostic Applications Smart Polypeptide Nanocarriers for Malignancy Therapeutics Part 2: Imaging and therapeutics Dimercaptosuccinic acid-coated magnetic nanoparticles as a localized delivery system in cancer immunotherapy Cardiovascular nanomedicine Chitosan-based systems for sustained drug release Nanocapsules in biomedicine: promises and challenges Chitosan-based polyelectrolyte complexes: characteristics and application in formulation of particulate drug carriers Part 3: Diagnostics and featured prognostics Non-invasive Glucose Biosensors based on Nanomaterials Self/directed Assembly of Nanoparticles: A review on various approaches Ion exchangers – an open window for the development of advanced materials with pharmaceutical and medical applications New Titanium Alloys for Biomedical Applications

Advanced Biosensors for Health Care Applications - Dr. Inamuddin 2019-06-15

Advanced Biosensors for Health Care Applications highlights the different types of prognostic and diagnostic biomarkers associated with cancer, diabetes, Alzheimer's disease, brain and retinal diseases, cardiovascular diseases, bacterial infections, as well as various types of electrochemical biosensor techniques used for early detection of the potential biomarkers of these diseases. Many advanced nanomaterials have attracted intense interests with their unique optical and electrical properties, high stability, and good biocompatibility. Based on these properties, advanced nanoparticles have been used as biomolecular carriers, signal producers, and signal amplifiers in biosensor design. Recent studies reported that there are several diagnostic methods available, but the major issue is the sensitivity and selectivity of these approaches. This book outlines the need of novel strategies for developing new systems to retrieve health information of patients in real time. It explores the potential of nano-multidisciplinary science in the design and development of smart sensing technology using micro-nanoelectrodes, novel sensing materials, integration with MEMS, miniaturized transduction systems, novel sensing strategy, that is, FET, CMOS, System-on-a-Chip (SoC), Diagnostic-on-a-Chip (DoC), and Lab-on-a-Chip (LOC), for diagnostics and personalized health-care monitoring. It is a useful handbook for specialists in biotechnology and biochemical engineering. Describes advanced nanomaterials for biosensor applications Relates the properties of available nanomaterials to specific biomarkers applications Includes diagnosis and electrochemical studies based on biosensors Explores the potential of nano-multidisciplinary science to design and develop smart sensing technologies Describes novel strategies for developing a new class of assay systems to retrieve the desired health information

Advanced Electrical and Electronics Materials - K. M. Gupta 2015-02-23

This comprehensive and unique book is intended to cover the vast and fast-growing field of electrical and electronic materials and their engineering in accordance with modern developments. Basic and pre-requisite information has been included for easy transition to more complex topics. Latest developments in various fields of materials and their sciences/engineering, processing and applications have been included. Latest topics like PLZT, vacuum as insulator, fiber-optics, high temperature superconductors, smart materials, ferromagnetic semiconductors etc. are covered. Illustrations and examples encompass different engineering disciplines such as robotics, electrical, mechanical, electronics, instrumentation and control, computer, and their inter-disciplinary branches. A variety of materials ranging from iridium to garnets, microelectronics, micro alloys to memory devices, left-handed materials, advanced and futuristic materials are described in detail.

Advanced Electrode Materials - Ashutosh Tiwari 2016-11-04

This book covers the recent advances in electrode materials and their novel applications at the cross-section of advanced materials. The book is divided into two sections: State-of-the-art electrode materials; and engineering of applied electrode materials. The chapters deal with electrocatalysis for energy conversion in view of bionanotechnology; surfactant-free materials and polyoxometalates through the concepts of biosensors to renewable energy applications; mesoporous carbon, diamond, conducting

polymers and tungsten oxide/conducting polymer-based electrodes and hybrid systems. Numerous approaches are reviewed for lithium batteries, fuel cells, the design and construction of anode for microbial fuel cells including phosphate polyanion electrodes, electrocatalytic materials, fuel cell reactions, conducting polymer based hybrid nanocomposites and advanced nanomaterials.

Biosensors Nanotechnology - Ashutosh Tiwari 2014-06-26

This book provides detailed reviews of a range of nanostructures used in the construction of biosensors as well as the applications of these biosensor nanotechnologies in the biological, chemical, and environmental monitoring fields Biological sensing is a fundamental tool for understanding living systems, but also finds practical application in medicine, drug discovery, process control, food safety, environmental monitoring, defense, and personal security. Moreover, a deeper understanding of the bio/electronic interface leads us towards new horizons in areas such as bionics, power generation, and computing. Advances in telecommunications, expert systems, and distributed diagnostics prompt us to question the current ways we deliver healthcare, while robust industrial sensors enable new paradigms in R&D and production. Despite these advances, there is a glaring absence of suitably robust and convenient sensors for body chemistries. This book examines some of the emerging technologies that are fueling scientific discovery and underpinning new products to enhance the length and quality of our lives. The 14 chapters written by leading experts cover such topics as: ZnO and graphene microelectrode applications in biosensing Assembly of polymers/metal nanoparticles Gold nanoparticle-based electrochemical biosensors Impedimetric DNA sensing employing nanomaterials Graphene and carbon nanotube-based biosensors Computational nanochemistry study of the BFPF green fluorescent protein chromophore Biosynthesis of metal nanoparticles Bioconjugated-nanoporous gold films in electrochemical biosensors The combination of molecular imprinting and nanotechnology Principles and properties of multiferroics and ceramics *A Fractal Analysis of Chemical Kinetics with Applications to Biological and Biosensor Interfaces* - Ajit Sadana 2018-07-31

A Fractal Analysis of Chemical Kinetics with Applications to Biological and Biosensor Interfaces analyzes the kinetics of binding and dissociation of different analytes by different biosensor techniques, demonstrating and then comparing each. Emphasis is placed on newer instrumentation techniques, such as SPRi (surface plasmon resonance imaging), and classical techniques, such as SPR (surface plasmon resonance), and finally, DNA biosensors and nanobiosensors. In addition, a final capstone chapter includes biosensor economics. These topics are all covered in one comprehensive book in a way that cannot be found elsewhere. Analyzes the kinetics of binding on biosensor surfaces Presents and compares different biosensor techniques Provides insights into the binding and dissociation mechanisms of analytes on biosensor surfaces Links the heterogeneity of biosensor surfaces to dissociation rate coefficients

Biosensor Based Advanced Cancer Diagnostics - Raju Khan 2021-08-25

Early diagnosis of cancer and other non-oncological disorders gives a significant advantage for curing the disease and improving patient's life expectancy. Recent advances in biosensor-based techniques which are designed for specific biomarkers can be exploited for early diagnosis of diseases. Biosensor Based Advanced Cancer Diagnostics covers all available biosensor-based approaches and comprehensive technologies; along with their application in diagnosis, prognosis and therapeutic management of various oncological disorders. Besides this, current challenges and future aspects of these diagnostic approaches have also been discussed. This book offers a view of recent advances and is also helpful for designing new biosensor-based technologies in the field of medical science, engineering and biomedical technology. Biosensor Based Advanced Cancer Diagnostics helps biomedical engineers, researchers, molecular biologists, oncologists and clinicians with the development of point of care devices for disease diagnostics and prognostics. It also provides information on developing user friendly, sensitive, stable, accurate, low cost and minimally invasive modalities which can be adopted from lab to clinics. This book covers in-depth knowledge of disease biomarkers that can be exploited for designing and development of a range of biosensors. The editors have summarized the potential cancer biomarkers and methodology for their detection, plus transferring the developed system to clinical application by miniaturization and required integration with microfluidic systems. Covers design and development of advanced platforms for rapid diagnosis of cancerous biomarkers Takes a multidisciplinary approach to sensitive transducers

development, nano-enabled advanced imaging, miniaturized analytical systems, and device packaging for point-of-care applications Offers an insight into how to develop cost-effective diagnostics for early detection of cancer

Functionalized Nanomaterials for Biosensing and Bioelectronics Applications - Sudheesh K. Shukla
2022-06-01

Functionalized Nanomaterials for Biosensing and Bioelectronics Applications: Trends and Challenges describes current and future opportunities for integrating the unique properties of two-dimensional nanomaterials with bioelectronic interfaces. Sections focus on background information and fundamental concepts, review the available functionalized nanomaterials and their properties, explore the integration of functionalized nanomaterials with bioelectronics, including available fabrication and characterization methods, electrical behavior at the interface, and design and synthesis guidelines, and review examples of microsystems where functionalized nanomaterials are being integrated with bioelectronics. This book is suitable for researchers and practitioners in academia and R&D working in materials science and engineering, analytical chemistry and related fields. Introduces the most common functionalized nanomaterials and their morphologies, properties and mechanisms for sensing applications Reviews functionalization and fabrication methods and techniques for the integration of one and two dimensional materials for sensing applications Addresses the most relevant applications of functionalized nanomaterials for biosensing and bioelectronics applications

Advanced 2D Materials - Ashutosh Tiwari 2016-07-12

This book brings together innovative methodologies and strategies adopted in the research and developments of Advanced 2D Materials. Well-known worldwide researchers deliberate subjects on (1) Synthesis, characterizations, modeling and properties, (2) State-of-the-art design and (3) innovative uses of 2D materials including: Two-dimensional layered gallium selenide Synthesis of 2D boron nitride nanosheets The effects of substrates on 2-D crystals Electrical conductivity and reflectivity of models of some 2D materials Graphene derivatives in semicrystalline polymer composites Graphene oxide based multifunctional composites Covalent and non-covalent polymer grafting of graphene oxide Graphene-semiconductor hybrid photocatalysts for solar fuels Graphene based sensors Graphene composites from bench to clinic Photocatalytic ZnO-graphene hybrids Hydroxyapatite-graphene bioceramics in orthopaedic applications

Advanced Materials Interfaces - Ashutosh Tiwari 2016-06-22

Advanced Material Interfaces is a state-of-the-art look at innovative methodologies and strategies adopted for interfaces and their applications. The 13 chapters are written by eminent researchers not only elaborate complex interfaces fashioned of solids, liquids, and gases, but also ensures cross-disciplinary mixture and blends of physics, chemistry, materials science, engineering and life sciences. Advanced interfaces operate fundamental roles in essentially all integrated devices. It is therefore of the utmost urgency to focus on how newly-discovered fundamental constituents and interfacial progressions can be materialized and used for precise purposes. Interfaces are associated in wide multiplicity of application spectrum from chemical catalysis to drug functions and the advancement is funnelled by fine-tuning of our fundamental understanding of the interface effects.

Technical Proceedings of the 2007 Cleantech Conference and Trade Show - NanoScience & Technology Inst 2019-08-22

The Cleantech conference, which runs parallel with NSTI's Nanotech, is designed to promote advancements in traditional technologies, emerging technologies, and clean business practices, covering important developments in renewable energy, clean technologies, business and policy, bio-energy, and novel technologies, as well as environme

Advanced Materials for Wastewater Treatment - Shahid Ul-Islam 2017-09-25

Over the past few decades, rapid industrialization, fast urban encroachment, and improved agricultural operations have introduced substantial amounts of potentially toxic organic substances into the atmosphere and into the aquatic and terrestrial environments. Advanced Materials for Wastewater Treatment brings together innovative methodologies and research strategies to remove toxic effluents from wastewaters. With contributions from leading scientists from all around the world, the book provides a comprehensive

coverage of the current literature, up-to-date overviews of all aspects of toxic chemical remediation including the role of nanomaterials.

Advanced Materials and Techniques for Biosensors and Bioanalytical Applications - Pranab Goswami 2020-11-01

Bioanalytical science and its technological subdomain, biosensors, are ever-evolving subjects, striving for rapid improvement in terms of performance and expanding the target range to meet the vast societal and market demands. The key performance factors for a biosensor that drive the research are selectivity, sensitivity, response time, accuracy, and reproducibility, with additional requirements of its portability and inexpensive nature. These performance factors are largely governed by the materials and techniques being used in these bioanalytical platforms. The selection of materials to meet these requirements is critical, as their interaction or involvement with the biological recognition elements should initiate or improve these performance factors. The technique discussed primarily applies to transducers involved in converting a biochemical signal to optical or electrical signals. Over the years, the emergence of novel materials and techniques has drastically improved the performance of these bioanalytical systems, enabling them to expand their analytical horizon. These advanced materials and techniques are central to modern bioanalytical and biosensor research. Advanced Materials and Techniques for Biosensors and Bioanalytical Applications provides a comprehensive review of the subject, including a knowledge platform for both academics and researchers. Considering biosensors as a central theme to this book, an outline on this subject with background principles has been included, with a scope of extending the utility of the book to coursework in graduate and postgraduate schools. Features: • Basic principles on different classes of biosensors, recent advances and applications • Smart materials for biosensors and other rapid, portable detection devices • Metal nanoparticles and nanocrystals for analytical applications • Carbon-based nanoparticles and quantum dots for sensing applications • Nanozymes as potential catalysts for sensing applications • Bioelectrochemiluminescence and photoelectrochemical-based biosensors • Paper electronics and paper-based biosensors • Microbial biosensors: artificial intelligence, genetic engineering, and synthetic biology • Biofuel cells as a signal transduction platform • FET-based biosensors, including ISFET and BioFET This book serves as a reference for scientific investigators and a textbook for a graduate-level course in biosensors and advanced bioanalytical techniques.

Advanced Surface Engineering Materials - Ashutosh Tiwari 2016-09-06

Advanced surfaces enriches the high-throughput engineering of physical and chemical phenomenon in relation to electrical, magnetic, electronics, thermal and optical controls, as well as large surface areas, protective coatings against water loss and excessive gas exchange. A more sophisticated example could be a highly selective surface permeability allowing passive diffusion and selective transport of molecules in the water or gases. The smart surface technology provides an interlayer model which prevents the entry of substances without affecting the properties of neighboring layers. A number of methods have been developed for coatings, which are essential building blocks for the top-down and/or bottom-up design of numerous functional materials. Advanced Surface Engineering Materials offers a detailed up-to-date review chapters on the functional coatings and adhesives, engineering of nanosurfaces, high-tech surface, characterization and new applications. The 13 chapters in this book are divided into 3 parts (Functional coatings and adhesives; Engineering of nanosurfaces; High-tech surface, characterization and new applications) and are all written by worldwide subject matter specialists. The book is written for readers from diverse backgrounds across chemistry, physics, materials science and engineering, medical science, environmental, bio- and nano- technologies and biomedical engineering. It offers a comprehensive view of cutting-edge research on surface engineering materials and their technological importance.

Advanced Catalytic Materials - Ashutosh Tiwari 2015-05-06

The subject of advanced materials in catalysis brings together recent advancements in materials synthesis and technologies to the design of novel and smart catalysts used in the field of catalysis. Nanomaterials in general show an important role in chemical processing as adsorbents, catalysts, catalyst supports and membranes, and form the basis of cutting-edge technology because of their unique structural and surface properties. Advanced Catalytic Materials is written by a distinguished group of contributors and the chapters provide comprehensive coverage of the current literature, up-to-date overviews of all aspects of

advanced materials in catalysis, and present the skills needed for designing and synthesizing advanced materials. The book also showcases many topics concerning the fast-developing area of materials for catalysis and their emerging applications. The book is divided into three parts: Nanocatalysts – Architecture and Design; Organic and Inorganic Catalytic Transformations; and Functional Catalysis: Fundamentals and Applications. Specifically, the chapters discuss the following subjects: Environmental applications of multifunctional nanocomposite catalytic materials Transformation of nanostructured functional precursors using soft chemistry Graphenes in heterogeneous catalysis Gold nanoparticles-graphene composites material for catalytic application Hydrogen generation from chemical hydrides Ring-opening polymerization of poly(lactic acid) Catalytic performance of metal alkoxides Cycloaddition of CO₂ and epoxides over reusable solid catalysts Biomass derived fine chemicals using catalytic metal bio-composites Homoleptic metal carbonyls in organic transformation Zeolites: smart materials for novel, efficient, and versatile catalysis Optimizing zeolitic catalysis for environmental remediation

Advanced Composite Materials - Ashutosh Tiwari 2016-09-14

Composites materials is basically the combining of unique properties of materials to have synergistic effects. A combination of materials is needed to adapt to certain properties for any application area. There is an everlasting desire to make composite materials stronger, lighter or more durable than traditional materials. Carbon materials are known to be attractive in composites because of their combination of chemical and physical properties. In the recent years, development of new composites has been influenced by precision green approaches that restrict hazardous substances and waste created during production. This book ranges from the fundamental principles underpinning the fabrication of different composite materials to their devices, for example, applications in energy harvesting, memory devices, electrochemical biosensing and other advanced composite-based biomedical applications. This book provides a compilation of innovative fabrication strategies and utilization methodologies which are frequently adopted in the advanced composite materials community with respect to developing appropriate composites to efficiently utilize macro and nanoscale features. The key topics are: Pioneer composite materials for printed electronics Current-limiting defects in superconductors High-tech ceramics materials Carbon nanomaterials for electrochemical biosensing Nanostructured ceramics and bioceramics for bone cancer Importance of biomaterials for bone regeneration Tuning hydroxyapatite particles Carbon nanotubes reinforced bioceramic composite Biomimetic prototype interface

Label-Free Biosensing - Michael J. Schöning 2018-07-20

This volume summarizes the state-of-the-art technologies, key advances and future trends in the field of label-free biosensing. It provides detailed insights into the different types of solid-state, label-free biosensors, their underlying transducer principles, advanced materials utilized, device-fabrication techniques and various applications. The book offers graduate students, academic researchers, and industry professionals a comprehensive source of information on all facets of label-free biosensing and the future trends in this flourishing field. Highlights of the subjects covered include label-free biosensing with: · semiconductor field-effect devices such as nanomaterial-modified capacitive electrolyte-insulator-semiconductor structures, silicon nanowire transistors, III-nitride semiconductor devices and light-addressable potentiometric sensors · impedimetric biosensors using planar and 3D electrodes · nanocavity and solid-state nanopore devices · carbon nanotube and graphene/graphene oxide biosensors · electrochemical biosensors using molecularly imprinted polymers · biomimetic sensors based on acoustic signal transduction · enzyme logic systems and digital biosensors based on the biocomputing concept · heat-transfer as a novel transducer principle · ultrasensitive surface plasmon resonance biosensors · magnetic biosensors and magnetic imaging devices

Intelligent Nanomaterials - Ashutosh Tiwari 2016-10-11

Overall, this book presents a detailed and comprehensive overview of the state-of-the-art development of different nanoscale intelligent materials for advanced applications. Apart from fundamental aspects of fabrication and characterization of nanomaterials, it also covers key advanced principles involved in utilization of functionalities of these nanomaterials in appropriate forms. It is very important to develop and understand the cutting-edge principles of how to utilize nanoscale intelligent features in the desired fashion. These unique nanoscopic properties can either be accessed when the nanomaterials are prepared

in the appropriate form, e.g., composites, or in integrated nanodevice form for direct use as electronic sensing devices. In both cases, the nanostructure has to be appropriately prepared, carefully handled, and properly integrated into the desired application in order to efficiently access its intelligent features. These aspects are reviewed in detail in three themed sections with relevant chapters: Nanomaterials, Fabrication and Biomedical Applications; Nanomaterials for Energy, Electronics, and Biosensing; Smart Nanocomposites, Fabrication, and Applications.

Advanced Materials for Agriculture, Food, and Environmental Safety - Ashutosh Tiwari 2014-08-11

The book focuses on the role of advanced materials in the food, water and environmental applications. The monitoring of harmful organisms and toxicants in water, food and beverages is mainly discussed in the respective chapters. The senior contributors write on the following topics: Layered double hydroxides and environment Corrosion resistance of aluminium alloys of silanes New generation material for the removal of arsenic from water Prediction and optimization of heavy clay products quality Enhancement of physical and mechanical properties of fiber Environment friendly acrylates latices Nanoparticles for trace analysis of toxins Recent development on gold nanomaterial as catalyst Nanosized metal oxide based adsorbents for heavy metal removal Phytosynthesized transition metal nanoparticles- novel functional agents for textiles Kinetics and equilibrium modeling Magnetic nanoparticles for heavy metal removal Potential applications of nanoparticles as antipathogens Gas barrier properties of biopolymer based nanocomposites: Application in food packing Application of zero-valent iron nanoparticles for environmental clean up Environmental application of novel TiO₂ nanoparticles

Nanobiosensors - Aiguo Wu 2020-06-02

Containing cutting edge research on the hot topic of nanobiosensor, this book will become highly read Biosensor research has recently re-emerged as most vibrant area in recent years particularly after the advent of novel nanomaterials of multidimensional features and compositions. Nanomaterials of different types and striking properties have played a positive role in giving the boost and accelerated pace to biosensors development technology. Nanobiosensors - From Design to Applications covers several aspects of biosensors beginning from the basic concepts to advanced level research. It will help to bridge the gap between various aspects of biosensors development technology and applications. It covers biosensors related material in broad spectrum such as basic concepts, biosensors & their classification, biomarkers & their role in biosensors, nanostructures-based biosensors, applications of biosensors in human diseases, drug detection, toxins, and smart phone based biosensors. Nanobiosensors - From Design to Applications will prove a source of inspiration for research on biosensors, their local level development and consequently using for practical application in different industries such as food, biomedical diagnosis, pharmaceuticals, agriculture, drug discovery, forensics, etc. * Discusses the latest technology and advances in the field of nanobiosensors and their applications in human diseases, drug detection, toxins * Offers a broad and comprehensive view of cutting-edge research on advanced materials such as carbon materials, nitride based nanomaterials, metal and metal oxide based nanomaterials for the fast-developing nanobiosensors research * Goes to a wide scientific and industry audience Nanobiosensors - From Design to Applications is a resource for polymer chemists, spectroscopists, materials scientists, physical chemists, surface chemists, and surface physicists.

Handbook on Synthesis Strategies for Advanced Materials - A. K. Tyagi 2021

This book presents state-of-the-art coverage of synthesis of advanced functional materials. Unconventional synthetic routes play an important role in the synthesis of advanced materials as many new materials are metastable and cannot be synthesized by conventional methods. This book presents various synthesis methods such as conventional solid-state method, combustion method, a range of soft chemical methods, template synthesis, molecular precursor method, microwave synthesis, sono-chemical method and high-pressure synthesis. It provides a comprehensive overview of synthesis methods and covers a variety of materials, including ceramics, films, glass, carbon-based, and metallic materials. Many techniques for processing and surface functionalization are also discussed. Several engineering aspects of materials synthesis are also included. The contents of this book are useful for researchers and professionals working in the areas of materials and chemistry.

Advanced Ceramic Materials - Ashutosh Tiwari 2016-08-05

Ceramic materials are inorganic and non-metallic porcelains, tiles, enamels, cements, glasses and refractory bricks. Today, "ceramics" has gained a wider meaning as a new generation of materials influence on our lives; electronics, computers, communications, aerospace and other industries rely on a number of their uses. In general, advanced ceramic materials include electro-ceramics, optoelectronic-ceramics, superconductive ceramics and the more recent development of piezoelectric and dielectric ceramics. They can be considered for their features including mechanical properties, decorative textures, environmental uses, energy applications, as well as their usage in bio-ceramics, composites, functionally graded materials, intelligent ceramics and so on. Advanced Ceramic Materials brings together a group of subject matter experts who describe innovative methodologies and strategies adopted in the research and development of the advanced ceramic materials. The book is written for readers from diverse backgrounds across chemistry, physics, materials science and engineering, medical science, pharmacy, environmental technology, biotechnology, and biomedical engineering. It offers a comprehensive view of cutting-edge research on ceramic materials and technologies. Divided into 3 parts concerning design, composites and functionality, the topics discussed include: Chemical strategies of epitaxial oxide ceramics nanomaterials Biphasic, triphasic and multiphase calcium orthophosphates Microwave assisted processing of advanced ceramic composites Continuous fiber reinforced ceramic matrix composites Ytria and magnesia doped alumina ceramic Oxidation induced crack healing SWCNTs vs MWCNTs reinforcement agents Organic and inorganic wastes in clay brick production Functional tantalum oxides Application of silver tin research on hydroxyapatite

Advanced Theranostic Materials - Ashutosh Tiwari 2015-07-10

The present book covers the recent advances in the development on the regulation of such theragnosis system and their biomedical perspectives to act as a future nanomedicine. Advanced Theranostics Materials is written by a distinguished group of contributors and provides comprehensive coverage of the current literature, up-to-date overview of all aspects of advanced theranostics materials ranging from system biology, diagnostics, imaging, image-guided therapy, therapeutics, biosensors, and translational medicine and personalized medicine, as well as the much broader task of covering most topics of biomedical research. The book focusses on the following topics: Part 1: System biology and translational medicine Aberrant Signaling Pathways: Hallmark of Cancer Cells and Target for Nanotherapeutics Application of Nanoparticles in Cancer Treatment Biomacromolecule-Gated Mesoporous Silica Drug Delivery Systems Construction of Functional DNA Nanostructures for Theranostic Applications Smart Polypeptide Nanocarriers for Malignancy Therapeutics Part 2: Imaging and therapeutics Dimercaptosuccinic acid-coated magnetic nanoparticles as a localized delivery system in cancer immunotherapy Cardiovascular nanomedicine Chitosan-based systems for sustained drug release Nanocapsules in biomedicine: promises and challenges Chitosan-based polyelectrolyte complexes: characteristics and application in formulation of particulate drug carriers Part 3: Diagnostics and featured prognostics Non-invasive Glucose Biosensors based on Nanomaterials Self/directed Assembly of Nanoparticles: A review on various approaches Ion exchangers - an open window for the development of advanced materials with pharmaceutical and medical applications New Titanium Alloys for Biomedical Applications

Advanced Materials for Future Terahertz Devices, Circuits and Systems - Aritra Acharyya 2021-02-12

This book highlights the properties of advanced materials suitable for realizing THz devices, circuits and systems, and processing and fabrication technologies associated with those. It also discusses some measurement techniques exclusively effective for THz regime, newly explored materials and recently developed solid-state devices for efficient generation and detection of THz waves, potentiality of metamaterials for implementing THz passive circuits and bio-sensors, and finally the future of silicon as the base material of THz devices. The book especially focuses on the recent advancements and several research issues related to THz materials and devices; it also discusses theoretical, experimental, established, and validated empirical works on these topics.

Advanced Biomaterials and Biodevices - Ashutosh Tiwari 2014-06-30

This cutting-edge book focuses on the emerging area of biomaterials and biodevices that incorporate

therapeutic agents, molecular targeting, and diagnostic imaging capabilities The design and development of biomaterials play a significant role in the diagnosis, treatment, and prevention of diseases. When used with highly selective and sensitive biomaterials, cutting-edge biodevices can allow the rapid and accurate diagnosis of disease, creating a platform for research and development, especially in the field of treatment for prognosis and detection of diseases in the early stage. This book emphasizes the emerging area of biomaterials and biodevices that incorporate therapeutic agents, molecular targeting, and diagnostic imaging capabilities. The 15 comprehensive chapters written by leading experts covers such topics as: The use of severe plastic deformation technique to enhance the properties of nanostructured metals Descriptions of the different polymers for use in controlled drug release Chitin and chitosan as renewable healthcare biopolymers for biomedical applications Innovated devices such as "label-free biochips" and polymer MEMS Molecular imprinting and nanotechnology Prussian Blue biosensing applications The evaluation of different types of biosensors in terms of their cost effectiveness, selectivity, and sensitivity Stimuli-responsive polypeptide nanocarriers for malignancy therapeutics

Seeking Sustainability in an Age of Complexity - Graham Harris 2007-06-14

Seeking Sustainability in an Age of Complexity explains the difficulties of sustainability and why 'collapse' can occur. In the last twenty years the theory of complexity has been developed - complex systems science (CSS) speaks to natural systems and particularly to ecological, social and economic systems and their interaction. Due to the growing concern over the huge changes occurring in the global environment, such as climate change, deforestation, habitat fragmentation and loss of biodiversity, Graham Harris sets out what has been learned in an attempt to understand the implications of these changes and suggests ways to move forward. This book discusses a number of emerging tools for the management of 'unruly' complexity which facilitate stronger regional dialogues about knowledge and values, which will be of interest to ecologists, sociologists, economists, natural resource managers and scientists in State and local governments and those involved in water and landscape management.

Proceedings of 21st International Conference on Advanced Materials & Nanotechnology 2018 - Conference Series 2018-08-29

September 04-06, 2018 Zurich, Switzerland Key Topics: Advanced Functional Materials, Advanced Optical Materials, Advanced Bio-Materials & Bio-devices, Polymers Science and Engineering, Emerging Areas of Materials Science, Advanced Ceramics and Composite Materials, Advancement in Nanomaterials Science and Nanotechnology, Carbon Based Materials, Materials Science and Engineering, Metals & Metallurgy, Entrepreneurs Investment Meet, Energy Materials and Harvesting, Advanced Computational Materials, Constructional and Engineering Materials, Environmental and Green Materials, Structural Materials, Biosensor and Bio-electronic Materials, Materials Physics, Materials Chemistry, Advanced Materials Engineering, Coatings and Surface Engineering,

Advanced Materials and Nano Systems: Theory and Experiment - Part 2 - Dibya Prakash Rai 2022-09-30

The discovery of new materials and the manipulation of their exotic properties for device fabrication is crucial for advancing technology. Nanoscience, and the creation of nanomaterials have taken materials science and electronics to new heights for the benefit of mankind. Advanced Materials and Nanosystems: Theory and Experiment covers several topics of nanoscience research. The compiled chapters aim to update students, teachers, and scientists by highlighting modern developments in materials science theory and experiments. The significant role of new materials in future technology is also demonstrated. The book serves as a reference for curriculum development in technical institutions and research programs in the field of physics, chemistry and applied areas of science like materials science, chemical engineering and electronics. This part covers 12 topics in these areas: - Recent advancements in nanotechnology: a human health Perspective. - An exploratory study on characteristics of SWIRL of AlGaAs/GaAs in advanced bio based nanotechnological systems. - Electronic structure of the half-Heusler ScAuSn, LuAuSn and their superlattice. - Recent trends in nanosystems. - Improvement of performance of single and multicrystalline silicon solar cell using low-temperature surface passivation layer and antireflection coating. - Advanced materials and nanosystems. - Effect of nanostructure-materials on optical properties of some rare earth ions doped in silica matrix. - Nd₂Fe₁₄B and SmCO₅: a permanent magnet for magnetic data storage and data transfer technology. - Visible light induced photocatalytic activity of MWCNTS decorated sulfide based

nano photocatalysts. - Organic solar cells. - Neodymium doped lithium borosilicate glasses. -

Comprehensive quantum mechanical study of structural features, reactivity, molecular properties and wave function-based characteristics of capmatinib.