Semiconductor Nanomaterials

The must-have ten-volume successor to the critically acclaimed Nanotechnologies for the Life Sciences series, Nanomaterials for the Life Sciences, 10 Volume Set provides an excellent, in-depth overview of all nanomaterial types and their uses in the life sciences. Each volume is dedicated to a specific material class and covers fundamentals, synthesis strategies, structure-property relationships, material behavior fine-tuning, biological effects, and applications in the life sciences. This landmark set provides materials scientists, chemists, biologists, molecular biologists, clinical physicists, physiological chemists, medicinal chemists, and toxicologists with essential awareness of life science applications.

While the chemistry, physics, and optical properties of simple atoms and molecules are quite well understood, this book demonstrates that there is much to be learned about the optics of nanomaterials. Through comparative analysis of the size-dependent optical response from nanomaterials, it is shown that although strides have been made in computational chemistry and physics, bridging length scales from nano to macro remains a major challenge. Organic, molecular, polymer, and biological systems are shown to be potentially useful models for assembly. Our progress in understanding the optical properties of biological nanomaterials is important driving force for a variety of applications.

After the drug discovery and development process, designing suitable formulations to safely deliver the optimum dose, while avoiding side effects, has been a constant challenge, especially when drugs are very toxic and have poor solubility and undesirable clearance profiles. With recent advances in synthetic technologies, nanoparticles can be custom-made from a variety of advanced materials to mimic the bioenvironment and can be equipped with various targeting and imaging moieties for site-specific delivery and real-time imaging. Drug Delivery Using Nanomaterials covers advancements in the field of nanoparticle-based drug-delivery systems, along with all the aspects needed for a successful and marketable nanoformulation. FEATURES Offers a general overview of the entire process involved in the synthesis and characterization of pharmaceutical nanoparticles Covers a broad range of synthetic materials for developing nanoformulations customized for specific disease states, target organs, and drugs Every chapter sequentially builds, providing a progressive pathway from classical nanoparticles to the more advanced to be used as a full drug product by consumers Provides information in a bottom-up manner in that definitions and explanations of relevant background information serve as a framework for understanding advanced concepts This user-friendly reference is aimed at materials engineers, chemical engineers, biomedical engineers, pharmaceutical scientists, chemists, and others working on advanced drug delivery, from academia as well as industry.

Nanomaterials for Drug Delivery and Therapy presents recent advances in the field of nanobiomaterials and their important applications in drug delivery, therapy and engineering. The book offers pharmaceutical perspectives, exploring the development of nanobiomaterials and their interaction with the human body. Chapters show how nanomaterials are used in treatments, including neurology, dentistry and cancer therapy. Authored by a range of contributors from global institutions, this book offers a broad, international perspective on how nanotechnology-based advances are leading to novel drug delivery and treatment solutions. It is a valuable research resource that will help both practicing medics and researchers in pharmaceutical science and nanomedicine learn more on how nanotechnology is improving treatments. Assesses the opportunities and challenges of nanotechnology-based drug delivery systems Explores how nanotechnology is being used

to create more efficient drug delivery systems Discusses which nanomaterials make the best drug carriers
Carbon Nanomaterials
Semiconductor Nanomaterials for Flexible Technologies
Synthesis, Properties, Characterization Techniques, and Applications
Organic-Inorganic Hybrid Nanomaterials
Electrochemistry of Nanomaterials
Nanomaterials for Drug Delivery and Therapy

The Series The new book series "Nanomaterials for the Life Sciences," successor to the highly acclaimed series "Nanotechnology for the Life Sciences," provides an in-depth overview of all nanomaterial types and their uses in the life sciences. Each volume is dedicated to a specific material class and covers fundamentals, synthesis and characterization strategies, structure-property relationships and biomedical applications. The new series brings nanomaterials to the life scientists and life science to the materials scientists so that synergies are seen and developed to the fullest. Written by international experts of various facets of this exciting field of research, the ten volumes of this single source of information comprehensively cover the complete range of nanomaterials for medical, biological and cybernetic applications. The series is aimed at scientists of the following disciplines: biology, chemistry, materials science, physics, bioengineering, and medicine, together with cell biology, biomedical engineering, pharmaceutical chemistry, and toxicology, both in academia and fundamental research as well as in pharmaceutical companies. Volume 3: Mixed Metal Nanomaterials Volume 3 covers the aspects of synthesis, characterization and application of bimetallic and multielemental spherical and anisotropic nanomaterials in the life sciences. For more information on NmLS, please visit www.NmLS.wiley-vch.de Characterization of Nanomaterials: Advances and Key Technologies discusses the latest advancements in the synthesis of various types of nanomaterials. The book's main objective is to provide a comprehensive review regarding the latest advances in synthesis protocols that includes up-to-date data records on the synthesis of all kinds of inorganic nanostructures using various physical and chemical methods. The synthesis of all important nanomaterials, such as carbon nanostructures, Core-shell Quantum dots, Metal and metal oxide nanostructures, Nanoferrites, polymer nanostructures, nanofibers, and smart nanomaterials are discussed, making this a one-stop reference resource on research accomplishments in this area. Leading researchers from industry, academia, government and private research institutions across the globe have contributed to the book. Academics, researchers, scientists, engineers and students working in the field of polymer nanocomposites will benefit from its solutions for material problems. Provides an up-to-date data record on the synthesis of all kinds of organic and inorganic nanostructures using various physical and chemical methods Presents the latest advances in synthesis protocols Presents latest techniques used in the physical and chemical characterization of nanomaterials Covers characterization of all the important materials groups such as: carbon nanostructures, core-shell quantumdots, metal and metal oxide nanostructures, nanoferrites, polymer nanostructures and nanofibers A broad range of applications is covered including the performance of batteries, solar cells, water filtration, catalysts, electronics, drug delivery, tissue engineering, food packaging, sensors and fuel cells Leading researchers from industry, academia, government and private research institutes have contributed to the books

This important book focuses on the synthesis and fabrication of nanostructures and nanomaterials, but also includes properties and applications of nanostructures and

nanomaterials, particularly inorganic nanomaterials. It provides balanced and comprehensive coverage of the fundamentals and processing techniques with regard to synthesis, characterization, properties, and applications of nanostructures and nanomaterials. Both chemical processing and lithographic techniques are presented in a systematic and coherent manner for the synthesis and fabrication of 0-D, 1-D, and 2-D nanostructures, as well as special nanomaterials such as carbon nanotubes and ordered mesoporous oxides. The book will serve as a general introduction to nanomaterials and nanotechnology for teaching and self-study purposes.
Engineering of nanophase materials and devices is of vital interest in electronics, semiconductors and optics, catalysis, ceramics and magnetism. Research associated with nanoparticles has widely spread and diffused into every field of scientific research, forming a trend of nanocrystal engineered materials. Electrochemical methods are widely used for the preparation of nanoparticles and the electrochemical properties of such nanomaterials are most relevant for their applications. This comprehensive reference work will appeal to advanced graduate students and researchers in the field specialized in electrochemistry, materials physics and materials science.
Advances and Key Technologies
Electron Transfer in Nanomaterials
Nanomaterials for Direct Alcohol Fuel Cells
Optics of Nanomaterials
Nanomaterials for Sustainable Energy and Environmental Remediation
Di Si Zu Ban Dao Ti Na Mi Cai Liao de Wei Jie Gou
Nanomaterials for Direct Alcohol Fuel Cells explains nanomaterials and nanocomposites as well as the characterization, manufacturing, and design of alcohol fuel cell applications. The advantages of direct alcohol fuel cells (DAFCs) are significant for reliable and long-lasting portable power sources used in devices such as mobile phones and computers. Even though substantial improvements have been made in DAFC systems over the last decade, more effort is needed to commercialize DAFCs by producing durable, low-cost, and smaller-sized devices. Nanomaterials have an important role to play in achieving this aim. The use of nanotechnology in DAFCs is vital due to their role in the synthesis of nanocatalysts within the manufacturing process. Lately, nanocatalysts containing carbon such as graphene, carbon nanotubes, and carbon nanocoils have also attracted much attention. When compared to traditional materials, carbon-based materials have unique advantages, such as high corrosion resistance, better electrical conductivity, and less catalyst poisoning. This book also covers different aspects of nanocomposites fabrication, including their preparation, design, and characterization techniques for their fuel cell applications. This book is an important reference source for materials scientists, engineers, energy scientists, and electrochemists who are seeking to improve their understanding of how nanomaterials are being used to enhance the efficiency and lower the cost of DAFCs. Shows how nanomaterials are being used for the design and manufacture of DAFCs Explores how nanotechnology is being used to enhance the synthesis and catalysis processes to create the next generation of fuel cells Assesses the major challenges of producing nanomaterial-based DAFCs on an industrial scale

This book is an overview of the strategies to generate high-quality films of one-dimensional semiconductor nanostructures on flexible substrates (e.g., plastics) and the use of them as building blocks to fabricating flexible devices (including electronics, optoelectronics, sensors, power systems). In addition to engineering aspects, the physics and chemistry behind the fabrication and device operation will also be discussed as well. Internationally recognized scientists from academia, national laboratories, and industries, who are the leading researchers in the emerging areas, are contributing exceptional chapters according to their cutting-edge research results and expertise. This book will be an on-time addition to the literature in nanoscience and engineering. It will be suitable for graduate students and researchers as a useful reference to stimulate their research interest as well as facilitate their research in nanoscience and engineering. Considers the physics and chemistry behind fabrication and device operation Discusses applications to electronics, optoelectronics, sensors and power systems Examines existing technologies and investigates emerging trends

The use of microwaves has gradually democratized itself in several scientific areas and is now a common methodology in domains as different as chemistry, protein digestion, mining, and metallurgy. Materials chemistry is one field where microwave irradiation technologies are being studied. In recent years, development of nanotechnologies has increased the interest of materials scientists in these new technologies. Microwave methodologies are now routinely used in several areas of materials science, and new advances are ongoing. This book presents recent improvements in microwave engineering of materials and nanomaterials, interactions of microwave chemistry with materials, and advances in microwave technologies in several domains such as polymer synthesis and modification, processing of various materials (ceramics, glasses, metallic alloys, zeolites), and synthesis and functionalization of diverse nanomaterials (carbon nanotubes, MOF semiconductors, inorganic nanoparticles). The book will be of interest to all students and researchers in materials science and nanosciences who want to discover or increase their knowledge of microwave technology.

This volume combines the chemistry and materials science of nanomaterials and biomolecules with their detection strategies, sensor physics and device engineering. In so doing, it covers the important types of nanomaterials for sensory applications, namely carbon nanotubes, fullerenes, fluorescent and biological molecules, nanorods, nanowires and nanoparticles, dendrimers, and nanostructured silicon. It also illustrates a wide range of sensing principles, including fluorescence, nanocantilever oscillators, electrochemical detection, antibody-antigen interactions, and magnetic detection.

Drug Delivery Using Nanomaterials

Environmental and Healthcare Applications

Nanomaterials and Nanocomposites

Nanostructures & Nanomaterials
Nanomaterials for Biosensors
Characterization of Nanomaterials

Semiconductor nanocrystals and metal nanoparticles are the building blocks of the next generation of electronic, optoelectronic, and photonic devices. Covering this rapidly developing and interdisciplinary field, the book examines in detail the physical properties and device applications of semiconductor nanocrystals and metal nanoparticles. It begins with a review of the synthesis and characterization of various semiconductor nanocrystals and metal nanoparticles and goes on to discuss in detail their optical, light emission, and electrical properties. It then illustrates some exciting applications of nanoelectronic devices (memristors and single-electron devices) and optoelectronic devices (UV detectors, quantum dot lasers, and solar cells), as well as other applications (gas sensors and metallic nanopastes for power electronics packaging). Focuses on a new class of materials that exhibit fascinating physical properties and have many exciting device applications. Presents an overview of synthesis strategies and characterization techniques for various semiconductor nanocrystal and metal nanoparticles. Examines in detail the optical/optoelectronic properties, light emission properties, and electrical properties of semiconductor nanocrystals and metal nanoparticles. Reviews applications in nanoelectronic devices, optoelectronic devices, and photonic devices.

Introducing the fields of nanomaterials and devices, and their applications across a wide range of academic disciplines and industry sectors, Donglu Shi bridges knowledge acquisition and practical work, providing a starting point for the research and development of applications. The book describes characterization of nanomaterials, their preparation methods and performance testing techniques; the design and development of nano-scale devices; and the applications of nanomaterials, with examples taken from different industry sectors, such as lighting, energy, bioengineering and medicine / medical devices. Key nanomaterial types are covered, such as carbon nanotubes, nanobiomaterials, nano-magnetic materials, semiconductor materials and nanocomposites. Shi also provides detailed coverage of key emerging technologies such

as DNA nanotechnology and spintronics. The resulting text is equally relevant for advanced students (senior and graduate) and for engineers and scientists from a variety of different academic backgrounds working in the multi-disciplinary field of nanotechnology. Provides detailed guidance for the characterization of nanomaterials, their preparation, and performance testing Explains the principles and challenges of the design and development of nano-scale devices Explores applications through cases taken from a range of different sectors, including electronics, energy and medicine.

This book can be roughly divided into three parts: fundamental physico-chemical and physical principles of Nanoscience, chemistry and synthesis of nanoparticles, and techniques to study nanoparticles. The first chapter is concerned with the origin of the size dependence of the properties of nanomaterials, explaining it in terms of two fundamental nanoscale effects. This chapter also serves as a general introduction to the book, briefly addressing the definition and classification of nanomaterials and the techniques used to fabricate and study them. Chapter 2 lays out the theoretical framework within which to understand size effects on the properties of semiconductor nanocrystals, with particular emphasis on the quantum confinement effect. The optical properties of metal nanoparticles and metal nanostructures (periodic lattices) are discussed in Chapter 3. Chapter 4 is devoted to nanoporous materials, treating in detail their synthesis, structure and functional properties, as well as the physical properties of liquids confined in nanopores. The preparation methods, characterization techniques, and applications of supported nanoparticles are covered in Chapter 5. The sixth Chapter presents the essential physical-chemical concepts needed to understand the preparation of colloidal inorganic nanoparticles, and the remarkable degree of control that has been achieved over their composition, size, shape and surface. The last four Chapters are dedicated to a few selected characterization techniques that are very valuable tools to study nanoparticles. Chapter 7 concentrates on electron microscopy techniques, while Chapter 8 focuses on scanning probe microscopy and spectroscopy. Electron paramagnetic resonance (EPR) based spectroscopic techniques and their application to nanoparticles are explored in Chapter 9. Finally, Chapter 10 shows how solution Nuclear

Magnetic Resonance (NMR) spectroscopic techniques can be used to unravel the surface chemistry of colloidal nanoparticles.

"This book introduces the basic concepts of nanomaterials and devices fabricated from these nanomaterials. Explicates cutting-edge topics and concepts in the field, such as plasmon-photon interaction and coupling of photonic crystals to devices with the purpose of enhancing the device performance. Provides a thorough background in quantum mechanics/physics. Successfully details the interrelationship between quantum mechanics and nanomaterials"--

Synthesis, Properties & Applications

Inorganic and Bioinorganic Perspectives

Nanomaterials

Advanced Rare Earth-Based Ceramic Nanomaterials

Handbook of Nanomaterials for Wastewater Treatment

Physical Properties and Device Applications

The first in-depth treatment of the synthesis, processing, and characterization of nanomaterials using lasers, ranging from fundamentals to the latest research results, this handy reference is divided into two main sections. After introducing the concepts of lasers, nanomaterials, nanoarchitectures and laser-material interactions in the first three chapters, the book goes on to discuss the synthesis of various nanomaterials in vacuum, gas and liquids. The second half discusses various nanomaterial characterization techniques involving lasers, from Raman and photoluminescence spectroscopies to light dynamic scattering, laser spectroscopy and such unusual techniques as laser photo acoustic, fluorescence correlation spectroscopy, ultrafast dynamics and laser-induced thermal pulses. The specialist authors adopt a practical approach throughout, with an emphasis on experiments, set-up, and results. Each chapter begins with an introduction and is uniform in covering the basic approaches, experimental setups, and dependencies of the particular method on different parameters, providing sufficient theory and modeling to understand the principles behind the techniques.

Handbook of Nanomaterials for Wastewater Treatment: Fundamentals and Scale up Issues provides coverage of the nanomaterials used for wastewater treatment, covering photocatalytic nanocomposite materials, nanomaterials used as adsorbents, water remediation processes, and their current status and challenges. The book explores the major applications of nanomaterials for effective catalysis and adsorption, also providing in-depth information on the properties and application of new advanced nanomaterials for wastewater treatment processes. This is an important reference source for researchers who need to solve basic and advanced problems relating to the use of nanomaterials for the development of wastewater treatment processes and technologies. As nanotechnology has the potential to substantially improve current water and wastewater treatment processes, the synthesis methods and physiochemical properties of nanomaterials and noble metal nanoparticles make their performance and mechanisms efficient for the treatment of various pollutants. Explains the properties of the most commonly used nanomaterials used for wastewater treatment Describes the major nanoscale synthesis and processing techniques for wastewater treatment Assesses the major challenges for using nanomaterials

on a mass scale for wastewater treatment

Green nanomaterials are classed as nanomaterials with no environmentally harmful, toxic, properties. The photocatalysis of nanomaterials involves photo-conduction value in efficient removal/degradation of noxious pollutants. Green nanotechnology has objectives for the development of products and processes which are environmentally friendly, economically sustainable, safe, energy-efficient, and produce little waste or emissions. Such products and processes are based on renewable materials and/or have a low net impact on the environment. Green functionalized nanomaterials, formed by a combination of nanomaterials with natural materials or are derived through a green source, are the new trends in the remediation of pollutants in environmental industries. This has the effect of making photoactive nanomaterials work under UV/sunlight radiation in order to produce reactive radical species that rapidly remove pollutants by redox mechanism. Green Functionalized Nanomaterials for Environmental Applications focuses on recent developments in the area of fabrication of green nanomaterials and their properties. It also looks at ways of lowering the risk of exposure of green functionalized nanomaterials. This needs to be pursued in the future for investigating and assessing health risks, which may be due to exposure to green nanomaterials. It is an important reference source for all those seeking to improve their understanding of how green functionalized nanomaterials are being used in a range of environmental applications, as well as considering potential toxicity implications. Highlights innovative industrial technologies for green functionalized nanomaterials Covers major fabrication techniques for sustainable functionalized nanomaterials Shows how sustainable functionalized nanomaterials are being developed for commercial applications

This text focuses on the synthesis, properties and applications of nanostructures and nanomaterials, particularly inorganic nanomaterials. It provides coverage of the fundamentals and processing techniques with regard to synthesis, properties, characterization and applications of nanostructures and nanomaterials.

Synthesis and Characterization of Semiconductor Nanomaterials

PbS, CdS, and CdTe

From Photovoltaics and Electronics to Sensors and Energy Storage

Microwave Engineering of Nanomaterials

Toxicity of Nanomaterials

The study of nanostructures has become, in recent years, a theme common to many disciplines, in which scientists and engineers manipulate matter at the atomic and molecular level in order to obtain materials and systems with significantly improved properties. Carbon nanomaterials have a unique place in nanoscience owing to their exceptional thermal, electrical, chemical, and mechanical properties, finding application in areas as diverse as super strong composite materials, energy storage and conversion, supercapacitors, smart sensors, targeted drug delivery, paints, and nanoelectronics. This book is the first to cover a broad spectrum of carbon nanomaterials, namely carbon nanofibers, vapor-grown carbon fibers, different forms of amorphous nanocarbons besides carbon nanotubes, fullerenes, graphene, graphene nanoribbons, graphene quantum dots, etc. in a single volume.

The book "Nanomaterials" includes all aspects of metal-oxide nano-structures, nano-composites, and polymer materials instigating with materials survey and preparations, growth and characterizations, processing and fabrications, developments and potential applications. These topics have utilized innovative methods of preparation, improvement, and continuous changes in multidimensional

ways. The innovative frontiers are branching out from time to time to advanced nanotechnology. It is an important booklet for scientific organizations, governmental research-centers, academic libraries, and the overall research and development of nano-materials in general. It has been created for widespread audience with diverse backgrounds and education.

Advances in Polymer Science enjoys a longstanding tradition and good reputation in its community. Each volume is dedicated to a current topic, and each review critically surveys one aspect of that topic, to place it within the context of the volume. The volumes typically summarize the significant developments of the last 5 to 10 years and discuss them critically, presenting selected examples, explaining and illustrating the important principles, and bringing together many important references of primary literature. On that basis, future research directions in the area can be discussed. Advances in Polymer Science volumes thus are important references for every polymer scientist, as well as for other scientists interested in polymer science - as an introduction to a neighboring field, or as a compilation of detailed information for the specialist.

Choice Recommended Title, April 2020 This comprehensive book, edited by two leading experts in nanotechnology and bioengineering with contributions from a global team of specialists, provides a detailed overview of the environmental and health impacts associated with the toxicology of nanomaterials. Special attention is given to nanomaterial toxicity during synthesis, production and application, and chapters throughout are focused on key areas that are important for future research and development of nanomaterials. This book will be of interest to advanced students studying biomedical engineering and materials science, PhD researchers, post-docs and academics working in the area of nanotechnology, medicine, manufacturing and regulatory bodies. Features: Collates and critically evaluates various aspects of the toxicology of nanomaterials in one comprehensive text Discusses the various effects of nanocrystals including the morphologies on cytotoxicity, in addition to the environmental and cytotoxicity risks of graphene and 2D nanomaterials Explores practical methods of detection and quantification, with applications in the environmental and healthcare fields

Synthesis, Properties, and Applications

Synthesis, Characterization, and Applications of II-VI Compound Semiconductor Nanomaterials and Superparamagnetic Nanoparticles

Photothermal Nanomaterials

Optical Properties and Spectroscopy of Nanomaterials

Nanostructures and Nanomaterials

Synthesis, Structure, Properties and Applications

Lanthanide-Doped Luminescent Nanomaterials reviews the latest advances in the development of lanthanide-doped luminescent inorganic nanoparticles for potential bioapplications. This book covers the chemical and physical fundamentals of these nanoparticles, such as the controlled synthesis methodology, surface modification chemistry, optical physics, and their promising applications in diverse bioassays, with an emphasis on heterogeneous and homogeneous in-vitro biodetection of tumor biomarkers. This book is intended for those readers who are interested in systematically understanding the materials design strategy, optical

behavior of lanthanide ions, and practical bioapplications of lanthanide nanoparticles. It primarily focuses on the interdisciplinary frontiers in chemistry, physics and biological aspects of luminescent nanomaterials. All chapters were written by scientists active in this field and for a broad audience, providing both beginners and advanced researchers with comprehensive information on the subject. Xueyuan Chen is a Professor at Fujian Institute of Research on the Structure of Matter (FJIRSM), Chinese Academy of Sciences. Yongsheng Liu is a Research Associate Professor at FJIRSM, Chinese Academy of Sciences. Datao Tu is a Research Assistant Professor at FJIRSM, Chinese Academy of Sciences.

This book introduces the wider field of functional nanomaterials sciences, with a strong emphasis on semiconductor photonics. Whether you are studying photonic quantum devices or just interested in semiconductor nanomaterials and their benefits for optoelectronic applications, this book offers you a pedagogical overview of the relevant subjects along with topical reviews. The book discusses different yet complementary studies in the context of ongoing international research efforts, delivering examples from both fundamental and applied research to a broad readership. In addition, a hand-full of useful optical techniques for the characterization of semiconductor quantum structures and materials are addressed. Moreover, nanostructuring methods for the production of low-dimensional systems, which exhibit advantageous properties predominantly due to quantum effects, are summarized. Science and engineering professionals in the interdisciplinary domains of nanotechnology, photonics, materials sciences, and quantum physics can familiarize themselves with selected highlights with eyes towards photonic applications in the fields of two-dimensional materials research, light–matter interactions, and quantum technologies.

Semiconductor NanomaterialsJohn Wiley & Sons

Nanostructured materials, especially, 1D, 2D and 3D nanostructures, and their engineered architectures are being increasingly used due to their potential to achieve sustainable development in energy and environmental sectors, providing a solution to a range of global challenges. A huge amount of research has been devoted in the recent past on the fine-tuning of nano-architecutres to accomplish innovations in energy storage and conversions, i.e., batteries, supercapacitors, fuel cells, solar cells, and electrochromic devices, bifunctional catalysts for ORR and OER, gas to fuels, liquid to fuels, and photocatalysts, corrosion, electrochemical sensors, and pollution and contaminants removal. Nanomaterials for Sustainable Energy and Environmental Remediation describes the fundamental aspects of a diverse range of nanomaterials for the sustainable development in energy and environmental remediation in a comprehensive manner. Experimental studies of varies nanomaterials will be discussed along with their design and applications, with specific attention to various chemical reactions involving and their challenges for catalysis, energy storage and conversion systems, and removal of pollutants are addressed. This book will also emphasise the challenges with past developments and direction for further research, details pertaining to the current ground - breaking technology and future perspective with multidisciplinary approach on energy,

nanobiotechnology and environmental science Summarizes the latest advances in how nanotechnology is being used in energy and environmental science Outlines the major challenges to using nanomaterials for creating new products and devices in the sustainable energy and environmental sectors Helps materials scientists and engineers make selection and design decisions regarding which nanomaterial to use when creating new produts and evices for energy and environmental applications

Workhorses of Nanoscience

Nanoparticles

Mixed Metal Nanomaterials

Fundamentals and Scale up Issues

Semiconductor Nanomaterials

From Fundamentals to Bioapplications

The main aims of this book are to summarize the fundamentals, synthesis methods, properties and applications of nanomaterials, so as to provide readers with a systematic knowledge on nanomaterials. In addition, the book covers most commonly used characterization tools pertaining to nanomaterials. Further, it deals with relevant aspects of nanocomposites which contains dispersion of nano-sized particulates, and carbon nanotubes (CNTs) in the matrices (polymer, metal and ceramic). It also discusses development of smart nano textiles (intelligent textiles), self-cleaning glass, sensors, actuators, ferro-fluids, and wear resistant nano coatings. Aimed at senior undergraduate and graduate students, the key features on this book include: Top-down and bottom-up approaches for the synthesis of nanomaterials included Illustrates sample preparation and basic principle of characterization tools for nanomaterials Explains calculation of ratios of surface area to volume and surface atoms to bulk atoms Reviews synthesis, properties and applications of carbon nanotubes and magnetic nanomaterials Discusses size effect on thermal, mechanical, optical, magnetic and electrical properties

Connecting inorganic chemistry to the hottest topic in materials science, this timely resource collects the contributions made by leading inorganic chemists towards nanomaterials research. The second volume in the “Wiley Encyclopedia of Inorganic Chemistry Methods and Applications Series,” this signature title concentrates on recent developments in the field and includes all key topics such as nanowires, nanotubes, biomineralization, supramolecular materials and much more. This volume is also available as part of Encyclopedia of Inorganic Chemistry, 5 Volume Set. This set combines all volumes published as EIC Books from 2007 to 2010, representing areas of key developments in the field of inorganic chemistry published in the Encyclopedia of Inorganic Chemistry. Find out more.

The exploration of photothermal nanomaterials with high light-to-heat conversion efficiency has paved the way for practical applications, including in cancer therapy, environmental remediation, catalysis, imaging and biomedicine. Covering the photothermal effect of different categories of light-absorbing nanomaterials, and focusing on metallic nanomaterials, 2D materials, semiconductors, carbon-based nanomaterials, polymeric nanomaterials and their composites, chapters in this book provide a systematic summary of recent advances in the fabrication and application of photothermal nanomaterials, discussing advantages, challenges and potential opportunities. This text will be a valuable resource for scientists working on photothermal nanomaterials, as well as those interested in the applications across chemistry, biomedicine, nanotechnology and materials science.

Advanced Rare Earth-Based Ceramic Nanomaterials focuses on recent advances related to

preparation methods and applications of advanced rare earth-based ceramic nanomaterials. Different approaches for synthesizing rare earth-based ceramic nanomaterials are discussed, along with their advantages and disadvantages for applications in various fields. Sections cover rare earth-based ceramic nanomaterials like ceria and rare earth oxides (R2O3), rare earth vanadates, rare earth titanates, rare earth zirconates, rare earth stannates, rare earth-based tungstates, rare earth-based manganites, ferrites, cobaltites, nickelates, rare earth doped semiconductor nanomaterials, rare earth molybdates, rare earth-based nanocomposites, rare earth-based compounds for solar cells, and laser nanomaterials based on rare-earth compounds. Reviews the chemistry and processing of rare earth doped ceramic nanomaterials and their characteristics and applications Covers a broad range of materials, including ceria and rare earth oxides (R2O3), vanadates, titanates, zirconates, stannates, tungstates, manganites, ferrites, cobaltites, nickelates, rare earth doped semiconductor nanomaterials, rare earth molybdates, rare earth-based nanocomposites, rare earth-based compounds for solar cells, and laser nanomaterials based on rare-earth compounds Includes different approaches to synthesizing each family of rare earth-based ceramic nanomaterials, along with their advantages and disadvantages Provides green chemistry-based methods for the preparation of advanced rare earth-based ceramic nanomaterials

Semiconductor Nanocrystals and Metal Nanoparticles

Lanthanide-Doped Luminescent Nanomaterials

Semiconductor Photonics of Nanomaterials and Quantum Structures

Characterization, Design, and Electrocatalysis

From Mesoscale to Nanoscale

Green Functionalized Nanomaterials for Environmental Applications

This book covers the photothermal effect of different categories of light-absorbing nanomaterials.

Spectroscopic Characterization of III-V Semiconductor Nanomaterials

Functionalized Inorganic Semiconductor Nanomaterials: Characterization, Properties, and Applications

Advanced Nanomaterials for Photothermal Agents

Nanomaterials and Devices

Introduction to Nanomaterials and Devices

Processing and Characterization with Lasers