

Biointeractions Of Nanomaterials

Biointeractions of Nanomaterials Nano-Materials as Photocatalysts for Degradation of Environmental Pollutants Nanoengineering Boron Nitride Nanotubes in Nanomedicine Nanoscience and Nanotechnology in Engineering Exposure to Engineered Nanomaterials in the Environment Case Studies in Nanotoxicology and Particle Toxicology Protein-Nanoparticle Interactions Advances in Nanomaterials for Drug Delivery Nanomedicine and Nanobiotechnology Nanotechnology and the Environment Nanomaterials for Advanced Biological Applications In Vitro Neuronal Networks Nanotoxicology Nanoscience in Dermatology Nanotechnology Research Directions for Societal Needs in 2020 Basic Fundamentals of Drug Delivery Handbook of Safety Assessment of Nanomaterials Nanopathology Magnetic Nanoheterostructures Technological Innovations in Sensing and Detection of Chemical, Biological, Radiological, Nuclear Threats and Ecological Terrorism Introduction to Nanoscale Science and Technology Capillary Electromigration Separation Methods Fundamentals of Nanotechnology Nanomaterial Biointeractions at the Cellular, Organismal and Systemic Levels Bioengineered Nanomaterials Bioactivity of Engineered Nanoparticles Medicinal Plants of South Asia Smart Nanoparticles for Biomedicine Textbook of Nanoscience and Nanotechnology Nanochemistry Adverse Effects of Engineered Nanomaterials Functionalization of Graphene Reactive Oxygen Species (ROS), Nanoparticles, and Endoplasmic Reticulum (ER) Stress-Induced Cell Death Mechanisms Nanomaterials: Ecotoxicity, Safety, and Public Perception Nanotoxicology Unraveling the Safety Profile of Nanoscale Particles and Materials - From Biomedical to Environmental Applications Noble and Precious Metals Design and Applications of Nanoparticles in Biomedical Imaging Nanoelectronic Materials

Biointeractions of Nanomaterials

Since the first publication of this book in 2007, the field of nanoscience and nanomedicine continues to grow substantially. This second edition, *Nanotoxicology: Progress toward Nanomedicine*, enlists internationally recognized experts to document the continuing development and rationale for the safe design of engineered nanomaterials (ENM). This includes new improved characterization endpoints, screening, and detection methods for in vitro and in vivo toxicity testing. These tools also contribute greatly to nanosafety research applied to nanomedicines. Topics include The impacts of nanotechnology on biomedicine, including functionalization for tissue-specific targeting, the biointeractions of multifunctional nanoparticle-based therapy, and the ability to control specific physicochemical properties of nanoparticles The requirements for proper detection, measurement, and assessment both for workplace exposure and in consumer products—with a focus on potential health and safety implications Predictive modeling, using quantitative nanostructure activity relationships to predict the pharmacokinetics and biodistribution of nanomaterials in the body Specific methodologies, imaging, and techniques to assess nanomaterials from the manufacturing process to nanomedicine applications Tools for assessing nanoparticle

toxicity and the limitations of detection methods for assessing toxicity in both in vivo and in vitro systems and at the single cell and tissue levels Toxicity of nanomaterials to specific organ systems, cell-based targeting to tumors, and other biomedical applications The difficulty of conducting risk assessments and the need for addressing knowledge gaps, especially with long-term studies A roadmap for future research The development of nanotechnology-based products must be complemented with appropriate validated methods to assess, monitor, manage, and reduce the potential risks of ENM to human health and the environment. This volume provides a cogent survey of advances in this area by a well-respected and diverse group of international scientists.

Nano-Materials as Photocatalysts for Degradation of Environmental Pollutants

This book arises from the NATO Advanced Study Institute “Technological Innovations in Detection and Sensing of CBRN Agents and Ecological Terrorism” held in Chisinau, Republic of Moldova in June 2010. It comprises a variety of invited contributions by highly experienced educators, scientists, and industrialists, and is structured to cover important aspects of the field that include developments in chemical-biological, and radiation sensing, synthesis and processing of sensors, and applications of sensors in detecting/monitoring contaminants introduced/dispersed inadvertently or intentionally in air, water, and food supplies. The book emphasizes nanomaterials and nanotechnology based sensing and also includes a section on sensing and detection technologies that can be applied to information security. Finally, it examines regional, national, and international policies and ethics related to nanomaterials and sensing. It will be of considerable interest and value to those already pursuing or considering careers in the field of nanostructured materials and nanotechnology based sensing, In general, it serves as a valuable source of information for those interested in how nanomaterials and nanotechnologies are advancing the field of sensing, detection, and remediation, policy makers, and commanders in the field.

Nanoengineering

The rapidly evolving field of nanomedicine refers to the clinical application of nanotechnologies. However, as with all new technologies, there are ethical, safety, and regulatory issues. This handbook, written by leading international experts, provides a meticulous overview of the state of the art of safety assessment of nanomaterials (nanotoxicology) in the context of their application in nanomedicine. The volume includes a historical perspective on the development of nanomedicine and its regulation, and a personal view of the future of (nano)medicine by Patrick Hunziker, president of the European Society of Nanomedicine. Ethical considerations in relation to nanomedicine are discussed. There are a series of chapters on organ-specific toxicities of nanomaterials, including pulmonary and cardiovascular toxicity, neurotoxicity, dermatotoxicity, and reproductive toxicity, as well as a discussion on immunotoxicity and genotoxicity. The importance of a

thorough characterization of physicochemical properties of nanomaterials is emphasized. The handbook also contains a critical discussion on the applicability of in vitro versus in vivo methods and models for nanosafety assessment, along with an introduction to mathematical modeling approaches with a view to a predictive toxicology of nanomaterials. The overall aim is to provide a comprehensive, science-based framework for safety assessment of current and future nanomedicines.

Boron Nitride Nanotubes in Nanomedicine

As the application of nanotechnology in the myriad disciplines of science and engineering--from agriculture, pharmaceuticals, material science, and biotechnology to sensors, electronics, and mechanical and electrical engineering--brings benefits it also can produce serious threats to human health and the environment that must be evaluated. The unique properties of nanomaterials make them different from their bulk counterparts. In addition to such unique properties, the nanometric size of nanomaterials can invite some detrimental effects on the health and well-being of living organisms and the environment. Thus, it is important to distinguish nanomaterials with such ill effects from nanomaterials with no or minimum toxicity. *Nanotoxicology: Toxicity Evaluation, Risk Assessment and Management* covers issues such as the basic principles of nanotoxicity, methods used for nanotoxicity evaluation, risk assessment and its management for nanomaterial toxicity with a focus on current trends, limitations, challenges, and future directions of nanotoxicity evaluation. Various experts from different countries discuss these issues in detail in this book. This will be helpful to researchers, educators, and students who are interested in research opportunities for avoiding the environmental and health hazards of nanomaterials. This book will also be useful for industrial practitioners, policy makers, and other professionals in the fields of toxicology, medicine, pharmacology, food, drugs, and other regulatory sciences.

Nanoscience and Nanotechnology in Engineering

This volume presents a comprehensive perspective on the global scientific, technological, and societal impact of nanotechnology since 2000, and explores the opportunities and research directions in the next decade to 2020. The vision for the future of nanotechnology presented here draws on scientific insights from U.S. experts in the field, examinations of lessons learned, and international perspectives shared by participants from 35 countries in a series of high-level workshops organized by Mike Roco of the National Science Foundation (NSF), along with a team of American co-hosts that includes Chad Mirkin, Mark Hersam, Evelyn Hu, and several other eminent U.S. scientists. The study performed in support of the U.S. National Nanotechnology Initiative (NNI) aims to redefine the R&D goals for nanoscale science and engineering integration and to establish nanotechnology as a general-purpose technology in the next decade. It intends to provide decision makers in academia, industry, and government with a nanotechnology community perspective of productive and responsible paths forward for nanotechnology R&D.

Exposure to Engineered Nanomaterials in the Environment

Many varieties of new, complex diseases are constantly being discovered, which leaves scientists with little choice but to embrace innovative methods for controlling the invasion of life-threatening problems. The use of nanotechnology has given scientists an opportunity to create nanomaterials that could help medical professionals in diagnosing and

Case Studies in Nanotoxicology and Particle Toxicology

This book brings together reviews from international experts who are exploring the biological activities of nanomaterials for medical applications or to better understand nanotoxicity. Topics include but are not limited to the following: 1) mechanistic understanding of nanostructure-bioactivity relationships; 2) the regulation of nanoparticles' bioactivity by means of chemical modification; 3) the new methodologies and standard methods used to assess nanoparticles' bioactivity; 4) the mechanisms involved in nanoparticle-biomolecule interactions and nanoparticle-cell interactions; and 5) biomedical applications of nanotechnology. The book will be a valuable resource for a broad readership in various subfields of chemical science, engineering, biology, environment, and medicine.

Protein-Nanoparticle Interactions

International interest in nanoscience research has flourished in recent years, as it becomes an integral part in the development of future technologies. The diverse, interdisciplinary nature of nanoscience means effective communication between disciplines is pivotal in the successful utilization of the science. Nanochemistry: A Chemical Approach to Nanomaterials is the first textbook for teaching nanochemistry and adopts an interdisciplinary and comprehensive approach to the subject. It presents a basic chemical strategy for making nanomaterials and describes some of the principles of materials self-assembly over 'all' scales. It demonstrates how nanometre and micrometre scale building blocks (with a wide range of shapes, compositions and surface functionalities) can be coerced through chemistry to organize spontaneously into unprecedented structures, which can serve as tailored functional materials. Suggestions of new ways to tackle research problems and speculations on how to think about assembling the future of nanotechnology are given. Primarily designed for teaching, this book will appeal to graduate and advanced undergraduate students. It is well illustrated with graphical representations of the structure and form of nanomaterials and contains problem sets as well as other pedagogical features such as further reading, case studies and a comprehensive bibliography.

Advances in Nanomaterials for Drug Delivery

The use of copper, silver, gold and platinum in jewelry as a measure of wealth is well known. This book contains 19 chapters written by international authors on other uses and applications of noble and precious metals (copper, silver, gold, platinum, palladium, iridium, osmium, rhodium, ruthenium, and rhenium). The topics covered include surface-enhanced Raman scattering, quantum dots, synthesis and properties of nanostructures, and its applications in the diverse fields such as high-tech engineering, nanotechnology, catalysis, and biomedical applications. The basis for these applications is their high-free electron concentrations combined with high-temperature stability and corrosion resistance and methods developed for synthesizing nanostructures. Recent developments in all these areas with up-to-date references are emphasized.

Nanomedicine and Nanobiotechnology

The environment is prone to suffer pollution and toxic insult from generations of nanomaterials as well from accidental releases during production, transportation, and disposal operations. The NMs could interact with and cause adverse biological effects at cellular, subcellular, and molecular levels. Assessing potential environmental/ecological risks requires quality information on transport and fate of nanoparticles in the environment, exposures and vulnerabilities of organisms to the nanomaterials and standard methods for assessing toxicity for aquatic or terrestrial organisms and human health. The systematic risk characterization and evaluation of the safety of nanomaterials require a multidisciplinary approach and convergence of knowledge and efforts from researchers and experts from toxicology, biotechnology, materials science, chemistry, physics, engineering, and other branches of life sciences. Although studies are beginning to appear in the literature addressing the toxicity of various nanomaterials and their potential for exposure, at this stage definitive statements regarding the impacts of nanomaterials on human health and the environment remain sketchy requiring an increased level of precautions with regard to nanomaterials, as has happened with other emerging contaminants and technologies (e.g., biotechnology). The need for an increased level of understanding the perception of risk and of benefits will vary and is likely to influence public, regulatory, and non-governmental activities regarding risk and benefit evaluations. Systematic identification and assessment of the risks posed by any new technology are essential. A prudent, integrated, and holistic approach is required to develop best practices based on the scientific understanding about what we know and what we don't know but need to know. Nanomaterials addresses key issues of ecotoxicological actions and effects of nanomaterials on life and environment, their threats, vulnerability, risks, and public perception. The readers learn to read bad news objectively and think about and search for ecological 'green' solutions to current environmental and ecological problems with blue, grey, brown, and red shades for building a sustainable ecosystem. It shows how this molecular terrain is a common ground for interdisciplinary research and education that will be an essential component of science, engineering and technology in the future. The book is divided into three sections. Section 1 includes general topics related to ecotoxicity of nanomaterials to microbes, plants, human and environment. Section 2 incorporates risks generated by the use of nanomaterials. Section 3 discuss safety issues and the public.

Nanotechnology and the Environment

In recent years, the fabrication of nanomaterials and exploration of their properties have attracted the attention of various scientific disciplines such as biology, physics, chemistry, and engineering. Although nanoparticulate systems are of significant interest in various scientific and technological areas, there is little known about the safety of these nanoscale objects. It has now been established that the surfaces of nanoparticles are immediately covered by biomolecules (e.g. proteins, ions, and enzymes) upon their entrance into a biological medium. This interaction with the biological medium modulates the surface of the nanoparticles, conferring a “biological identity” to their surfaces (referred to as a “corona”), which determines the subsequent cellular/tissue responses. The new interface between the nanoparticles and the biological medium/proteins, called “bio-nano interface,” has been very rarely studied in detail to date, though the interest in this topic is rapidly growing. In this book, the importance of the physicochemical characteristics of nanoparticles for the properties of the protein corona is discussed in detail, followed by comprehensive descriptions of the methods for assessing the protein-nanoparticle interactions. The advantages and limitations of available corona evaluation methods (e.g. spectroscopy methods, mass spectrometry, nuclear magnetic resonance, electron microscopy, X-ray crystallography, and differential centrifugal sedimentation) are examined in detail, followed by a discussion of the possibilities for enhancing the current methods and a call for new techniques. Moreover, the advantages and disadvantages of protein-nanoparticle interaction phenomena are explored and discussed, with a focus on the biological impacts.

Nanomaterials for Advanced Biological Applications

Nanotechnology and the Environment presents the latest research results in nanotechnology that have both environmental applications and implications. Chemists, physicists, chemical engineers, and policy makers will be interested in reading this book.

In Vitro Neuronal Networks

Medicinal Plants of South Asia: Novel Sources for Drug Discovery provides a comprehensive review of medicinal plants of this region, highlighting chemical components of high potential and applying the latest technology to reveal the underlying chemistry and active components of traditionally used medicinal plants. Drawing on the vast experience of its expert editors and authors, the book provides a contemporary guide source on these novel chemical structures, thus making it a useful resource for medicinal chemists, phytochemists, pharmaceutical scientists and everyone involved in the use, sales, discovery and development of drugs from natural sources. Provides comprehensive reviews of 50 medicinal plants and their key properties Examines the background and botany of each source before going on to discuss underlying phytochemistry

and chemical compositions Links phytochemical properties with pharmacological activities Supports data with extensive laboratory studies of traditional medicines

Nanotoxicology

Boron Nitride Nanotubes in Nanomedicine compiles, for the first time in a single volume, all the information needed by researchers interested in this promising type of smart nanoparticles and their applications in biomedicine. Boron nitride nanotubes (BNNTs) represent an innovative and extremely intriguing class of nanomaterials. After introducing BNNTs and explaining their preparation and evaluation, the book shows how the physical, chemical, piezoelectric and biocompatibility properties of these nanotubes give rise to their potential uses in biomedicine. Evidence is offered (from both in vitro and in vivo investigations) for how BNNTs can be useful in biomedical and nanomedicine applications such as therapeutic applications, tissue regeneration, nanovectors for drug delivery, and intracellular nanotransducers. Covers a range of promising biomedical BNNT applications Provides great value not just to academics but also industry researchers in fields such as materials science, molecular biology, pharmacology, biomedical engineering, and biophysical sciences Offers evidence for how BNNTs can be useful in biomedical and nanomedicine applications such as therapy, tissue regeneration, nanovectors for drug delivery, and intracellular nanotransducers Incorporates, for the first time in a single volume, all the information needed by researchers interested in this promising type of smart nanoparticles and their applications in biomedicine

Nanoscience in Dermatology

This book covers the most recent advances in using nanoparticles for biomedical imaging, including magnetic resonance imaging (MRI), magnetic particle imaging (MPI), nuclear medicine, ultrasound (US) imaging, computed tomography (CT), and optical imaging. Topics include nanoparticles for MRI and MPI, siRNA delivery, theranostic nanoparticles for PET imaging of drug delivery, US nanoparticles for imaging drug delivery, inorganic nanoparticles for targeted CT imaging, and quantum dots for optical imaging. This book serves as a valuable resource for the fundamental science of diagnostic nanoparticles and their interactions with biological targets, providing a practical handbook for improved detection of disease and its clinical implementation.

Nanotechnology Research Directions for Societal Needs in 2020

Nanoscience in Dermatology covers one of the two fastest growing areas within dermatological science, nanoscience and nanotechnology in dermatology. Recently, great progress has been made in the research and development of

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nanotechnologies and nanomaterials related to various applications in medicine and, in general, the life sciences. There is increasing enthusiasm for nanotechnology applications in dermatology (drug delivery, diagnostics, therapeutics, imaging, sensors, etc.) for understanding skin biology, improving early detection and treatment of skin diseases, and in the design and optimization of cosmetics. Light sensitive nanoparticles have recently been explored, opening a new era for the combined applications of light with nanotechnology, also called photonanodermatology. However, concerns have been raised regarding the adverse effects of intentional and unintentional nanoparticle exposure and their toxicity. Written by experts working in these exciting fields, this book extensively covers nanotechnology applications, together with the fundamentals and toxicity aspects. It not only addresses current applications of nanotechnology, but also discusses future trends of these ever-growing and rapidly changing fields, providing scientists and dermatologists with a clear understanding of the advantages and challenges of nanotechnology in skin medicine. Provides knowledge of current and future applications of nanoscience and nanotechnology in dermatology Outlines the fundamentals, methods, toxicity aspects, and other relevant aspects for nanotechnology based applications in dermatology Coherently structured book written by experts working in the fields covered

Basic Fundamentals of Drug Delivery

This book contains most updated information on synthesis of magnetic nanohybrids, their physio-chemical properties, and key biological applications. It highlights the complexity of nanoheterostructures, especially magnetic metal oxides, ferrites and doped magnetic nanomaterials, and discusses their potential applications in the early detection, imaging and treatment of cancer. It also covers the toxicity and risk assessment of multifunctional nanomaterials. Providing an overview of magnetic nanoheterostructures, it appeals to a wide audience, from beginners and graduate-level students to experts in academia and industry.

Handbook of Safety Assessment of Nanomaterials

Nano-Materials as Photocatalysts for Degradation of Environmental Pollutants: Challenges and Possibilities contains both practical and theoretical aspects of environmental management using the processes of photodegradation and various heterogeneous catalysts. The book's main focus is on the degradation of harmful pollutants, such as petrochemicals, crude oils, dyes, xenobiotic pharmaceutical waste, endocrine disrupting compounds, and other common pollutants. Chapters incorporate both theoretical and practical aspects. This book is useful for undergraduate or university students, teachers and researchers, especially those working in areas of photocatalysis through heterogeneous catalysts. The primary audience for this book includes Chemical Engineers, Environmental Engineers and scientists, scholars working on the management of hazardous waste, scientists working in fields of materials science, and Civil Engineers working on

wastewater treatment. Reviews recent trends in the photodegradation of organic pollutants Offers a bibliometric analysis of photocatalysis for environmental abatement Includes many degradation mechanisms of organic pollutants using various catalysts Includes examples on the degradation of organic pollutants from various sources, e.g., pharmaceuticals, dyes, pesticides, etc. Discusses the effect of nanocatalysts on soil, plants and the ecosystem

Nanopathology

An essential reference that discusses occupational exposure and the adverse health effects of engineered nanomaterials and highlights current and future biomedical applications of these nanomaterials in relation to nanosafety. Multi-authored book written by leading US and European experts on nanotoxicology and nanomedicine Discusses the health implications and a clinical translation of experimental data in this area Takes a schematic, non-exhaustive approach to summarize the most important research data in this field Includes a glossary, with a brief explanation of the term and with a reference to where the term or phrase has been used will be included within the book

Magnetic Nanoheterostructures

Exposure to Engineered Nanomaterials in the Environment provide a new, holistic framework for testing and evaluating the potential benefits and risks of engineered nanomaterials (ENMs), including their potential socioeconomic impacts, ethical issues and consumers' expectations and fears. The book covers nanomaterial presence in various environments, agroecosystems and other areas within the human sphere of actions. The book includes sections on (i) Chemical, physical and biological properties, (ii) Presence and diffusion of ENMs in human environments, agriculture, food and drug products, (iii) ENMs as a pillar in biological and medical research, and (iv) Social and regulatory issues emerging from years of application. The book is designed to increase awareness to key end-users and stakeholders, including food producers and processors, industry, representatives of society and consumers, and those looking to implement an accurate and effective risk analysis procedure that promotes the sustainable use of nanotechnology. Assesses both the positive and negative impacts of engineered nanomaterials in the environment Shows how engineered nanomaterials are used in agricultural environments, food products, drugs and cosmetics Discusses the unique properties of a range of engineered nanomaterials that lead to their environmental effects

Technological Innovations in Sensing and Detection of Chemical, Biological, Radiological, Nuclear Threats and Ecological Terrorism

This book presents an overview of the ways in which the latest experimental and theoretical nanotechnologies are serving

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the fields of biotechnology, medicine, and biomaterials. They not only enhance the efficiency of common therapeutics and lower their risks, but thanks to their specific properties, they also provide new capabilities. Nano-scale measurement techniques, such as nano-indentation and nano-scratch methods, could potentially be used to characterize the physical and mechanical properties of both natural tissues and synthetic biomaterials in terms of strength and durability.

Introduction to Nanoscale Science and Technology

Nanoengineering: Global Approaches to Health and Safety Issues provides a global vision on the impact of engineered nanomaterials both for the consumer/general public and in occupational settings. The book also presents a hint on what can be expected for the future from nanomaterials and their effects on our lives, both at home and at work. In addition, users will find valuable information on nanomaterials' irreplaceable value and their risks for health, safety, and environmental issues. Case studies illustrate key points and provide information on important processes. Provides a global vision on the different aspects related to nanosafety and a synthesis of the information available Gives all the information required for precision decision-making in a single book, offering both general public and occupational aspects Contains separate chapters on each subject written by world-renowned contributors Presents a complete vision of the problem, with perspectives on global approaches Includes case studies that illustrate important processes

Capillary Electromigration Separation Methods

An examination of the widespread application of nano materials in biology, medicine, and pharmaceuticals and the accompanying safety concerns, Bio-interactions of Nano Materials addresses the issues related to toxicity and safety of nano materials and nano systems. It covers the interactions in biological systems and presents various tools and meth

Fundamentals of Nanotechnology

Basic Fundamentals of Drug Delivery covers the fundamental principles, advanced methodologies and technologies employed by pharmaceutical scientists, researchers and pharmaceutical industries to transform a drug candidate or new chemical entity into a final administrable drug delivery system. The book also covers various approaches involved in optimizing the therapeutic performance of a biomolecule while designing its appropriate advanced formulation. Provides up-to-date information on translating the physicochemical properties of drugs into drug delivery systems Explores how drugs are administered via various routes, such as orally, parenterally, transdermally or through inhalation Contains extensive references and further reading for course and self-study

Nanomaterial Biointeractions at the Cellular, Organismal and Systemic Levels

Smart Nanoparticles for Biomedicine explores smart nanoparticles that change their structural or functional properties in response to specific external stimuli (electric or magnetic fields, electromagnetic radiation, ultrasound, etc.). Particular attention is given to multifunctional nanostructured materials that are pharmacologically active and that can be actuated by virtue of their magnetic, dielectric, optically-active, redox-active, or piezoelectric properties. This important reference resource will be of great value to readers who want to learn more on how smart nanoparticles can be used to create more effective treatment solutions. Nanotechnology has enabled unprecedented control of the interactions between materials and biological entities, from the microscale, to the molecular level. Nanosurfaces and nanostructures have been used to mimic or interact with biological microenvironments, to support specific biological functions, such as cell adhesion, mobility and differentiation, and in tissue healing. Recently, a new paradigm has been proposed for nanomedicine to exploit the intrinsic properties of nanomaterials as active devices rather than as passive structural units or carriers for medications. Discusses the synthesis, characterization and applications of a new generation of smart nanoparticles for nanomedicine applications Explores the problems relating to the biocompatibility of a range of nanoparticles, outlining potential solutions Describes techniques for manipulating specific classes of nanoparticles for a variety of treatment types

Bioengineered Nanomaterials

All set to become the standard reference on the topic, this book covers the most important procedures for chemical functionalization, making it an indispensable resource for all chemists, physicists, materials scientists and engineers entering or already working in the field. Expert authors share their knowledge on a wide range of different functional groups, including organic functional groups, hydrogen, halogen, nanoparticles and polymers.

Bioactivity of Engineered Nanoparticles

The usage of nanoscience and nanotechnology in engineering directly links academic research in the above two fields of nanoscience and nanotechnology to industries and daily life. As a result, numerous nanomaterials, nanodevices and nanosystems for various engineering purposes have been developed and used for human betterment. This book, which consists of eight self-contained chapters, provides the essential theoretical knowledge and important experimental techniques required for the research and development on nanoscience and nanotechnology in engineering, and deals with the five key topics in this area ? Nanoscience and Nanotechnology in Engineering is based on the many lectures and courses presented around the world by its authors.

Medicinal Plants of South Asia

This book provides a comprehensive overview of the incredible advances achieved in the study of in vitro neuronal networks for use in basic and applied research. These cultures of dissociated neurons offer a perfect trade-off between complex experimental models and theoretical modeling approaches giving new opportunities for experimental design but also providing new challenges in data management and interpretation. Topics include culturing methodologies, neuroengineering techniques, stem cell derived neuronal networks, techniques for measuring network activity, and recent improvements in large-scale data analysis. The book ends with a series of case studies examining potential applications of these technologies.

Smart Nanoparticles for Biomedicine

This book is meant to serve as a textbook for beginners in the field of nanoscience and nanotechnology. It can also be used as additional reading in this multifaceted area. It covers the entire spectrum of nanoscience and technology: introduction, terminology, historical perspectives of this domain of science, unique and widely differing properties, advances in the various synthesis, consolidation and characterization techniques, applications of nanoscience and technology and emerging materials and technologies.

Textbook of Nanoscience and Nanotechnology

The range of nanomaterial applications has expanded recently from catalysis, electronics, and filtration to therapeutics, diagnostics, agriculture, and food because of unique properties and potentials of different nanoparticles and nanomaterials. Research shows that these exquisite particles can interact with an organism at the cellular, physiological, biochemical, and molecular levels. However, our knowledge of how they affect these changes, selectively or generally, in diverse organism or ecosystems is very limited and far from satisfactory. Data indicate that the biological function largely depends on the shape, size, and surface characteristics of the nanoparticles used besides life cycle stages of an organism. Therefore, this compilation will focus on the body of work carried out by distinguished investigators using diverse nanomaterials and plant and animal species. This book includes specific case studies as well as general review articles highlighting aspects of multilayered interactions, and targets not only research and academic scholars but also the concerned industry and policy makers as well.

Nanochemistry

Case Studies in Nanotoxicology and Particle Toxicology presents a highly-illustrated analysis of the most prominent cases on the adverse effects of nanoparticles and their impact on humans and the environment. This comprehensive reference demonstrates the possible risks imposed by managing and handling nanoparticles, showing the effects of involuntary inhalation or ingestion during their use and after their incineration. Through the use of numerous examples, readers will discover the possible risks and effects of working with nanoparticles, along with best practices to prevent these effects. The text is an essential reference for anyone working in the risk assessment of nanoparticles, including nanosafety professionals, occupational toxicologists, regulatory toxicologists, and clinicians. Presents real-life cases showing the potential risks to human health following exposure to nanoparticles An ideal reference for anyone working in the risk assessment of nanoparticles, including nanosafety professionals, occupational toxicologists, regulatory toxicologists, and clinicians Provides examples to help assess risks of handling engineered nanomaterials Advises on the best forms of protection and the safest nanotechnological products

Adverse Effects of Engineered Nanomaterials

Capillary Electromigration Separation Methods is a thorough, encompassing reference that not only defines the concept of contemporary practice, but also demonstrates its implementation in laboratory science. Chapters are authored by recognized experts in the field, ensuring that the content reflects the latest developments in research. Thorough, comprehensive coverage makes this the ideal reference for project planning, and extensive selected referencing facilitates identification of key information. The book defines the concept of contemporary practice in capillary electromigration separation methods, also discussing its applications in small mass ions, stereoisomers, and proteins. Edited and authored by world-leading capillary electrophoresis experts Presents comprehensive coverage on the subject Includes extensive referencing that facilitates the identification of key research developments Provides more than 50 figures and tables that aid in the retention of key concepts

Functionalization of Graphene

Nanomedicine is a developing field, which includes different disciplines such as material science, chemistry, engineering and medicine devoted to the design, synthesis and construction of high-tech nanostructures. The ability of these structures to have their chemical and physical properties tuned by structural modification, has allowed their use in drug delivery systems, gene therapy delivery, and various types of theranostic approaches. Colloidal noble metal nanoparticles and other nanostructures have many therapeutic and diagnostic applications. The concept of drug targeting as a magic bullet has led to much research in chemical modification to design and optimize the binding to targeted receptors. It is important to understand the precise relationship between the drug and the carrier and its ability to target specific tissues, and

pathogens to make an efficient drug delivery system. This book covers advances based on different drug delivery systems: polymeric and hyper branched nanomaterials, carbon-based nanomaterials, nature-inspired nanomaterials, and pathogen-based carriers.

Reactive Oxygen Species (ROS), Nanoparticles, and Endoplasmic Reticulum (ER) Stress-Induced Cell Death Mechanisms

WINNER 2009 CHOICE AWARD OUTSTANDING ACADEMIC TITLE! Nanotechnology is no longer a subdiscipline of chemistry, engineering, or any other field. It represents the convergence of many fields, and therefore demands a new paradigm for teaching. This textbook is for the next generation of nanotechnologists. It surveys the field's broad landscape, exploring the physical basics such as nanorheology, nanofluidics, and nanomechanics as well as industrial concerns such as manufacturing, reliability, and safety. The authors then explore the vast range of nanomaterials and systematically outline devices and applications in various industrial sectors. This color text is an ideal companion to Introduction to Nanoscience by the same group of esteemed authors. Both titles are also available as the single volume Introduction to Nanoscience and Nanotechnology Qualifying instructors who purchase either of these volumes (or the combined set) are given online access to a wealth of instructional materials. These include detailed lecture notes, review summaries, slides, exercises, and more. The authors provide enough material for both one- and two-semester courses.

Nanomaterials: Ecotoxicity, Safety, and Public Perception

From the reviews: "A class in nanoscale science and technology is daunting for the educator, who must organize a large collection of materials to cover the field, and for the student, who must absorb all the new concepts. This textbook is an excellent resource that allows students from any engineering background to quickly understand the foundations and exciting advances of the field. The example problems with answers and the long list of references in each chapter are a big plus for course tutors. The book is organized into seven sections. The first, nanoscale fabrication and characterization, covers nanolithography, self-assembly, and scanning probe microscopy. Of these, we enjoyed the section on nanolithography most, as it includes many interesting details from industrial manufacturing processes. The chapter on self-assembly also provides an excellent overview by introducing six types of intermolecular interactions and the ways these can be employed to fabricate nanostructures. The second section covers nanomaterials and nanostructures. Out of its 110 pages, 45 are devoted to carbon nanotubes. Fullerenes and quantum dots each have their own chapter that focuses on the properties and applications of these nanostructures. Nanolayer, nanowire, and nanoparticle composites of metals and semiconductors are briefly covered (just 12 pages), with slightly more discussion of specific applications. The section on nanoscale electronics begins with a history of microelectronics before discussing the difficulties in shrinking transistor size

further. The discussion of problems (leakage current, hot electrons, doping fluctuations, etc.) and possible solutions (high- k dielectrics, double-gate devices) could easily motivate deeper discussions of nanoscale electrical transport. A chapter on molecular electronics considers transport through alkanes, molecular transistors, and DNA in a simple, qualitative manner we found highly instructive. Nanoscale magnetic systems are examined in the fourth section. The concept of quantum computation is nicely presented, although the discussion of how this can be achieved with controlled spin states is (perhaps necessarily) not clear. We found the chapter on magnetic storage to be one of the most lucid in the book. The giant magnetoresistive effect, operation of spin valves, and issues in magnetic scaling are easier to understand when placed in the context of the modern magnetic hard disk drive. Micro- and nanoelectromechanical systems are covered with an emphasis on the integration of sensing, computation, and communication. Here, the student can see advanced applications of lithography. The sixth section, nanoscale optoelectronics, describes quantum dots, organic optoelectronics, and photonic crystals. The chapter on organic optoelectronics is especially clear in its discussion of the fundamentals of this complicated field. The book concludes with an overview of nanobiotechnology that covers biomimetics, biomolecular motors, and nanofluidics. Because so many authors have contributed to this textbook, it suffers a bit from repetition. However, this also allows sections to be omitted without any adverse effect on student comprehension. We would have liked to see more technology to balance the science; apart from the chapters on lithography and magnetic storage, little more than an acknowledgment is given to commercial applications. Overall, this book serves as an excellent starting point for the study of nanoscale science and technology, and we recommend it to anyone with a modest scientific background. It is also a great vehicle to motivate the study of science at a time when interest is waning. Nanotechnology educators should look no further." (MATERIALS TODAY, June 2005)

Nanotoxicology

Reactive Oxygen Species (ROS), Nanoparticles, and Endoplasmic Reticulum (ER) Stress-Induced Cell Death Mechanisms presents the role of ROS-mediated pathways cellular signaling stress, endoplasmic reticulum (ER) stress, oxidative stress, oxidative damage, nanomaterials, and the mechanisms by which metalloids and nanoparticles induce their toxic effects. The book covers the ecotoxicology of environmental heavy metal ions and free radicals on macromolecules cells organisms, heavy metals-induced cell responses, oxidative stress, the source of oxidants, and the roles of ROS, oxidative stress and oxidative damage mechanisms. It also examines the nanotoxicity, cytotoxicity and genotoxicity mechanisms of nanomaterials and the effects of nanoparticle interactions. Antioxidant defense therapy and strategies for treatment round out the book, making it an ideal resource for researchers and professional scientists in toxicology, environmental chemistry, environmental science, nanomaterials and the pharmaceutical sciences. Covers the ecotoxicology of environmental heavy metal ions and the interactions between specific heavy metals-induced cell responses and oxidative stress Provides a better understanding of the mechanism of nanomaterial-induced toxicity as a first defense for hazard prevention Covers

recent advances in new nanomedication technologies for the effects of NPs on oxidative stress, ROS and ER stress
Discusses the effects of interactions between antioxidant defense therapy, ROS and strategies for treatment

Unraveling the Safety Profile of Nanoscale Particles and Materials - From Biomedical to Environmental Applications

This book presents synthesis techniques for the preparation of low-dimensional nanomaterials including 0D (quantum dots), 1D (nanowires, nanotubes) and 2D (thin films, few layers), as well as their potential applications in nanoelectronic systems. It focuses on the size effects involved in the transition from bulk materials to nanomaterials; the electronic properties of nanoscale devices; and different classes of nanomaterials from microelectronics to nanoelectronics, to molecular electronics. Furthermore, it demonstrates the structural stability, physical, chemical, magnetic, optical, electrical, thermal, electronic and mechanical properties of the nanomaterials. Subsequent chapters address their characterization, fabrication techniques from lab-scale to mass production, and functionality. In turn, the book considers the environmental impact of nanotechnology and novel applications in the mechanical industries, energy harvesting, clean energy, manufacturing materials, electronics, transistors, health and medical therapy. In closing, it addresses the combination of biological systems with nanoelectronics and highlights examples of nanoelectronic-cell interfaces and other advanced medical applications. The book answers the following questions: • What is different at the nanoscale? • What is new about nanoscience? • What are nanomaterials (NMs)? • What are the fundamental issues in nanomaterials? • Where are nanomaterials found? • What nanomaterials exist in nature? • What is the importance of NMs in our lives? • Why so much interest in nanomaterials? • What is at nanoscale in nanomaterials? • What is graphene? • Are pure low-dimensional systems interesting and worth pursuing? • Are nanotechnology products currently available? • What are sensors? • How can Artificial Intelligence (AI) and nanotechnology work together? • What are the recent advances in nanoelectronic materials? • What are the latest applications of NMs?

Noble and Precious Metals

Describes the impact of nanoparticles and microparticles on human and animal health and offers criteria for preventing potential problems deriving from these particles.

Design and Applications of Nanoparticles in Biomedical Imaging

This book presents the laboratory, scientific and clinical aspects of nanomaterials used for medical applications in the fields of regenerative medicine, dentistry and pharmacy. It gives a broad overview on the in vitro compatibility assessment of

nanostructured materials implemented in the medical field by the combination of classical biological protocols and advanced non-destructive nano-precision techniques with special emphasis on the topographical, surface energy, optical and electrical properties. Materials in the physical form of nanoparticles, nanotubes, and thin films are addressed in terms of their toxicity. The different pillars of the Nanomedicine field are also highlighted. The book takes an interdisciplinary approach of medicine, biology, pharmacy, physics, chemistry, engineering, nanotechnology and materials science. The international group of authors specifically chosen for their distinguished expertise belong to the academic and industrial world in order to provide a broader perspective. It appeals to researchers and graduate students.

Nanoelectronic Materials

As nanomaterials become increasingly present in our daily lives, pertinent questions regarding their safety arise. Nanomaterial risk assessment, as in other areas, directs much of the effort worldwide in defining guidelines that may be translated into national or international directives. Nanomaterials encompass different entities, from nanoparticles to nanostructured materials, with specific effects over cells, tissues, organisms and ecosystems depending on their biophysical characteristics. Such interactions will directly affect the impact of novel nanotechnologies. This book aims to provide the reader with a comprehensive overview of the current state of the art in nanotoxicology, featuring the most important developments and critical issues regarding the use of and exposure to nanoparticles.

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