

Applications Of Nanotechnology In Mechanical Engineering

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Handbook of Nanotechnology Applications Springer Science & Business Media

Handbook of Nanotechnology Applications: Environment, Energy, Agriculture and Medicine presents a comprehensive overview on recent developments and prospects surrounding nanotechnology use in water/wastewater separation and purification, energy storage and conversion, agricultural and food process, and effective diagnoses and treatments in medical fields. The book includes detailed overviews of nanotechnology, including nanofiltration membrane for water/wastewater treatment, nanomedicine and nanosensor development for medical implementation, advanced nanomaterials of different structural dimensions (0D, 1D, 2D and 3D) for energy applications, as well as food and agricultural utilization. Other sections discuss the challenges of lab-based research transitioning towards practical industrial use. Helps scientists and researchers quickly learn and understand the key role of nanotechnology in important industrial applications Takes an interdisciplinary approach, demonstrating how nanotechnology is being used in a wide range of industry sectors Outlines the role nanotechnology plays in creating safer, cheaper and more energy-efficient projects and devices

Graphene and Nanoparticles Hybrid Nanocomposites Springer

This comprehensive reference text discusses advance concepts and applications in the field of nanotechnology. The text presents a detailed discussion of key important concepts including nanomaterials and nanodevices, nano-bio interface, nanoscale memories, and semiconductor nanotechnology. It discusses applications of nanotechnology in the fields of aerospace engineering, cosmetic industry, pharmaceutical science, food industry, and the textile industry. The text will be useful for senior undergraduate and graduate students in the field of electrical engineering, electronics engineering, nanotechnology, and pharmaceutical science. Discussing fundamental, advanced concepts and their applications in a single volume, this text will be useful as a reference text for senior undergraduate and graduate students in the field of electrical engineering, electronics engineering, nanotechnology, and pharmaceutical science. It comprehensively discusses important concepts such as nano-robotics, carbon-based nanomaterials, and nanoscale memories. The text discusses advanced concepts of nanotechnology and its applications in the fields of textile, pharmaceutical sciences, aerospace, and food industry. It will be an ideal reference text for senior undergraduate and graduate students in the field of electrical engineering, electronics engineering, nanotechnology, and nanoscience.

Nanoelectronic Materials Elsevier

Nanotechnology is the fastest-growing technology in the world, and it is also called the Industrial Revolution of the twenty-first century. Many research, development, and manufacturing methods have been used globally to develop better and safer nanomaterials for various applications.

Nanotechnology teaches us the critical properties of day-to-day materials and structures. The invention of the scanning tunneling microscope (STM), carbon nanotubes (CNTs), and fullerenes (or buckyballs) laid a path toward nanotechnology because atomic- and molecular-level studies could be performed using the STM and nanomaterials. Today this technology is employed in various fields such as engineering, technology, applied sciences, biomedical, pharmaceuticals, food and agriculture, and construction industries. The number of technical articles and patents related to nanotechnology and nanoproducts has been continuously increasing for nearly two decades. Within 10 or 15 years, it is expected that the industrial production of nanotechnology will be worth over \$1 trillion. Thus, this technology will drastically change science, education, manufacturing, and the lifestyles of people around the world.

Structural Nanocrystalline Materials

Elsevier

Environmental devices help in monitoring the collection of one or more measurements that are used to access the status of an environment. Today, environmental monitoring and analytical methods are among the most rapidly developing branches of

analysis. The functionalization of nanomaterials in the field of environmental science has increasing importance with regards to the fabrication of devices. Functionalized nanomaterials reformulate new materials and advanced characteristics for improved application in comparison to old fashion materials and open an opportunity for the development of devices for introducing new technology and techniques for monitoring environmental challenges. The monitoring of these environmental challenges in advances have direct impact on health and sustainability. Functionalized nanomaterials have different mechanical, absorption, optical or electrical properties than original nanomaterials. In fact, major utilization of nanomaterials occurs in their functionalized forms, which are very different from the parent material. This handbook provides an overview of the different state-of-the-art materials, devices and environmental applications of functionalized nanomaterials. In addition, the information offers a platform for ongoing research in the field of environmental science and device fabrication. The main objective of this book is to cover the major areas focusing on the functionalization of nanomaterials, device fabrication along with different techniques and environmental applications of functionalized nanomaterials-based devices. This is an important reference source for materials scientists, engineers and environmental scientists who are looking to increase their understanding of how functionalized nanomaterial-based devices are being used for environmental monitoring applications. Helps the reader to understand the basic principles of functionalization of nanomaterials Highlights fabrication and characterization methods for functionalized nanomaterials-based environmental monitoring devices Assesses the major challenges of creating devices using functionalized nanomaterials on a mass scale

Nanotechnology I. K. International Pvt Ltd

"This book provides the latest developments in the field of space research and structural mechanics. It also explores the mechanics of nanomaterials, the advancement of their electronic properties, the development of the methods of synthesis of the nanomaterials for fabricating nanodevices, and related technological expertise to assemble the nano components for fabricating the devices"--*Springer Handbook of Nanotechnology* World Scientific Publishing Company

Nanotechnology has developed remarkably in recent years and, applied in the food industry, has allowed new industrial advances, the improvement of conventional technologies, and the commercialization of products with new features and functionalities. This progress offers the potential to increase productivity for producers, food security for consumers and economic growth for industries. *Food Applications of Nanotechnology* presents the main advances of nanotechnology for food industry development. The fundamental concepts of the technique are presented, followed by examples of application in several sectors, such as the enhancement of flavor, color and sensory characteristics; the description of the general concepts of nano-supplements, antimicrobial nanoparticles and other active compounds into food; and developments in the field of packaging, among others. In addition, this work updates readers on the industrial development and the main regulatory aspects for the safety and commercialization of nanofoods. Features: Provides a general overview of nanotechnology in the food industry Discusses the current status of the production and use of nanomaterials as food additives Covers the technological developments in the areas of flavor, color and sensory characteristics of food and food additives Reviews nanosupplements and how they provide improvements in nutritional functionality Explains the antibacterial properties of nanoparticles for food applications This book will serve food scientists and technologists, food engineers, chemists and innovators working in food or ingredient research and new product development. Gustavo Molina is associate professor at the UFVJM (Diamantina—Brazil) in Food Engineering and head of the Laboratory of Food Biotechnology and conducts scientific and

technical research. His research interests are focused on industrial biotechnology. Dr. Inamuddin is currently working as assistant professor in the chemistry department of Faculty of Science, King Abdulaziz University, Jeddah, Saudi Arabia. He is also a permanent faculty member (assistant professor) at the Department of Applied Chemistry, Aligarh Muslim University, Aligarh, India. He has extensive research experience in multidisciplinary fields of analytical chemistry, materials chemistry, and electrochemistry and, more specifically, renewable energy and environment. Prof. Abdullah M. Asiri is professor of organic photochemistry and has been the head of the chemistry department at King Abdulaziz University since October 2009, as well as the director of the Center of Excellence for Advanced Materials Research (CEAMR) since 2010. His research interest covers color chemistry, synthesis of novel photochromic and thermochromic systems, synthesis of novel coloring matters and dyeing of textiles, materials chemistry, nanochemistry and nanotechnology, polymers, and plastics. Franciele Maria Pelissari graduated in Food Engineering; earned her master's degree (2009) at the University of Londrina (UEL), Londrina, Brazil; and her PhD (2013) at the University of Campinas (Unicamp), Campinas, Brazil. Since 2013, she has been associate professor at the Institute of Science and Technology program at the Federal University of Jequitinhonha and Mucuri (UFVJM), Diamantina, Brazil, in Food Engineering, and also full professor in the graduate program in Food Science and Technology. CRC Press

This book examines the application of nanoscience and nanotechnology in military defence strategies. Both historical and current perspectives on military technologies are discussed. The book provides comprehensive details on current trends in the application of nanotechnology to ground, air, and naval specializations. Furthermore, nanotechnology-enabled high energy explosives and propellants, chemical, biological, radiation, and nuclear threats and their detection/protection, and camouflage and stealth for signature management of military targets in multispectral wavelength signals are analyzed. The book also covers nanotechnology-enabled armor and platforms, which may serve as lightweight and high mechanical strength options in contrast to conventional systems. Finally, the book also emphasizes future military applications of nanotechnology and its integration into 'smart' materials. Provides comprehensive details on trends in the application of nanotechnology to ground, air, and naval defence systems; Examines the application of nanoscience and nanotechnology in military defence strategies; Offers pathways and research avenues for development of nanotechnology and materials applications in military capacities.

Dental Applications of Nanotechnology CRC Press

In this research notes book, the modelling of mechanical properties of CNT/polymer nanocomposites is presented. The book begins with the structural and intrinsic mechanical properties of CNTs and then introduces computational methods that have been applied to polymer nanocomposites, covering from molecular scale (molecular dynamics, Monte Carlo), microscale (Brownian dynamics, dissipative particle dynamics, lattice Boltzmann, time-dependent Ginzburg–Landau method, dynamic density functional theory method) to mesoscale and macroscale (micromechanics, equivalent-continuum and self-similar approaches, finite element method). Knowledge of the nature and mechanics of the length and orientation of nanotubes, and load transfer between nanotubes and polymers, is critical for the manufacturing of enhanced carbon nanotube polymer composites. It also enables the tailoring of the interface for specific applications or superior mechanical properties. This book discusses the state of these parameters in mechanics of carbon nanotube polymer composites and presents some directions for future research in this field. The book's aim is to enhance current knowledge in this area to support researchers in carbon nanotubes and help them choose the appropriate modelling tool for accomplishing their research.

Foundations of Nanotechnology, Volume Three IGI Global Quantum mechanics transcends and supplants classical mechanics at the atomic and subatomic levels. It provides the underlying framework for many subfields of physics, chemistry and materials science, including condensed matter physics, atomic physics, molecular physics, quantum chemistry, particle physics, and nuclear physics. It is the only way we can understand the structure of materials, from the semiconductors in our computers to the metal in our automobiles. It is also the scaffolding supporting much of nanoscience and nanotechnology. The purpose of this book is to present the fundamentals of quantum theory within a modern perspective, with emphasis on applications to nanoscience and nanotechnology, and information-technology. As the frontiers of science have advanced, the sort of curriculum adequate for students in the sciences and engineering twenty years ago is no

longer satisfactory today. Hence, the emphasis on new topics that are not included in older reference texts, such as quantum information theory, decoherence and dissipation, and on applications to nanotechnology, including quantum dots, wires and wells. This book provides a novel approach to Quantum Mechanics whilst also giving readers the requisite background and training for the scientists and engineers of the 21st Century who need to come to grips with quantum phenomena. The fundamentals of quantum theory are provided within a modern perspective, with emphasis on applications to nanoscience and nanotechnology, and information-technology. Older books on quantum mechanics do not contain the amalgam of ideas, concepts and tools necessary to prepare engineers and scientists to deal with the new facets of quantum mechanics and their application to quantum information science and nanotechnology. As the frontiers of science have advanced, the sort of curriculum adequate for students in the sciences and engineering twenty years ago is no longer satisfactory today. There are many excellent quantum mechanics books available, but none have the emphasis on nanotechnology and quantum information science that this book has.

Nanotechnology: Concepts, Methodologies, Tools, and Applications Springer Science & Business Media

Volume is indexed by Thomson Reuters CPCI-S (WoS). The objective of this special collection was to provide an excellent platform for updating and discussing the latest advances in precision engineering-related fields by researchers and engineers from research laboratories, academia and industry all over the world. The volume covers a wide gamut of topics in precision engineering-related fields, ranging over precision machining, advanced measurement techniques and green and sustainable manufacturing. This work will provide a stimulus and inspiration for future studies and advancement in precision engineering and manufacturing technologies.

Food Applications of Nanotechnology Engineering Science Reference

Nanocrystalline materials exhibit exceptional mechanical properties, representing an exciting new class of structural materials for technological applications. The advancement of this important field depends on the development of new fabrication methods, and an appreciation of the underlying nano-scale and interface effects. This authored book addresses these essential issues, presenting for the first time a fundamental, coherent and current account at the theoretical and practical level of nanocrystalline and nanocomposite bulk materials and coatings. The subject is approached systematically, covering processing methods, key structural and mechanical properties, and a wealth of applications. This is a valuable resource for graduate students studying nanomaterials science and nanotechnologies, as well as researchers and practitioners in materials science and engineering.

Mechanical Properties of Nanomaterials CRC Press

The realms of aerospace and structural mechanics have been revolutionized due to a plethora of technological advances. These two important sectors most notably have been impacted by the advancement of nanotechnology and have introduced potential groundbreaking changes for lightweight, high strength, and improved electronic properties of nanomaterials. Nanotechnology in Aerospace and Structural Mechanics aims to provide a collection of innovative research on the latest development of materials and methods for designing smart and intelligent devices for use in the field of space research and structural mechanics. It provides a thorough study of the fabrication and control of mechanical systems required for the successful application of nanotechnology in aerospace and structural engineering. While highlighting topics including nanomaterial properties, aerospace electronics, and polymer nanocomposites, this book is ideally designed for engineers, researchers, students, and academicians with interests in the fields of civil engineering, mechanical engineering, aerospace engineering, and nanoscience.

Emerging Nanotechnology Applications in Electrical Engineering CRC Press

The study of electrochemical nanotechnology has emerged as researchers apply electrochemistry to nanoscience and nanotechnology. These two related volumes in the Modern Aspects of Electrochemistry Series review recent developments and breakthroughs in the specific application of electrochemistry and nanotechnology to biology and medicine. Internationally renowned experts contribute chapters that address both fundamental and practical aspects of several key emerging technologies in biomedicine, such as the processing of new biomaterials, biofunctionalization of surfaces, characterization of biomaterials, discovery of novel phenomena and biological processes occurring at the molecular level.

Nanotechnology in Aerospace and Structural Mechanics Springer Nature

Biopolymeric Nanomaterials: Fundamentals and Applications outlines the fundamental design concepts and emerging applications of biopolymeric nanomaterials. The book also provides information on emerging applications of biopolymeric nanomaterials, including in biomedicine, manufacturing and water purification, as well as assessing their physical, chemical and biological properties. This is an important reference source for materials scientists, engineers and biomedical scientists who are seeking to increase their understanding of how polymeric nanomaterials are being used for a range of biomedical and industrial applications. Biopolymeric nanomaterials refer to biocompatible nanomaterials, consisting

of biopolymers, such as protein (silk, collagen, gelatin, β -casein, zein, and albumin), protein-mimicked polypeptides and polysaccharides (chitosan, alginate, pullulan, starch, and heparin). Biopolymeric nanomaterials may be used as i) delivery systems for bioactive compounds in food application, (ii) for delivery of therapeutic molecules (drugs and genes), or for (iii) tissue engineering. Provides information on the design concepts and synthesis of biopolymeric nanomaterials in biomedical and industrial applications. Highlights the major properties and processing methods for biopolymeric nanomaterials. Assesses the major challenges of producing biopolymeric nanomaterials on an industrial scale.

Nano Mechanics and Materials John Wiley & Sons

This book covers the recent research on nanomaterials and nanotechnology based on the hybridization of graphene with other nanoparticles. With their simple synthesis, nanoscale dimensions, high aspect ratio, mechanical, electrical and thermal properties, graphene and its hybridized materials have witnessed a great interest, and the chapters in this book cover the spectrum of research from the preparation and synthesis of novel nanocomposites to their potential use in aeronautic, automotive, energy and environmental applications. Written by respected researchers from both industry and academia, this book is of interest to researchers and students working on nanomaterials.

Functionalized Nanomaterials Based Devices for Environmental Applications IGI Global

This book provides an overview of the electronic applications of nanotechnology. It presents latest research in the areas of nanotechnology applied to the fields of electronics and energy. Various topics covered in this book include nanotechnology in electronic field, electronic chips and circuits, batteries, wireless devices, energy storage, semiconductors, fuel cells, defense and military equipment, and aerospace industry. This book will be useful for engineers, researchers and industry professionals primarily in the fields of electrical engineering, materials science and nanotechnology.

Nanotechnology in the Automotive Industry Trans Tech Publications Ltd

The energy sector continues to receive increased attention from both consumers and producers due to its impact on all aspects of life. Electrical energy especially has become more in demand because of the delivery of the service to a large percentage of consumers in addition to the progress and increase of industrial production. It is thus necessary to find advanced systems capable of transferring huge amounts of electrical energy efficiently and safely. Nanotechnology aims to develop new types of atomic electronics that adopt quantum mechanics and the movement of individual particles to produce equipment faster and smaller and solve problems attributed to the electrical engineering field. *Emerging Nanotechnology Applications in Electrical Engineering* contains innovative research on the methods and applications of nanoparticles in electrical engineering. This book discusses the wide array of uses nanoparticles have within electrical engineering and the diverse electric and magnetic properties that nanomaterials help make prevalent. While highlighting topics including electrical applications, magnetic applications, and electronic applications, this book is ideally designed for researchers, engineers, industry professionals, practitioners, scientists, managers, manufacturers, analysts, students, and educators seeking current research on nanotechnology in electrical, electronic, and industrial applications.

Explorations in the Application of Nanotechnology to Improve the Mechanical Properties of Composite Materials Springer Nature

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?

Advancing Medicine through Nanotechnology and Nanomechanics Applications Springer Nature

Nanotechnology in the Automotive Industry explores how nanotechnology and nanomaterials are used to enhance the performance of materials and devices for automotive application by fabricating nano-alloys, nanocomposites, nano coatings, nanodevices, nanocatalysts and nanosensors. Consisting of 36 chapters in 6 parts, this new volume in the Micro and Nano Technologies series is for materials scientists, nanotechnologists and automotive engineers working with nanotechnology and nanomaterials for automotive applications. Nanotechnology is seen as one of the core technologies for the future automotive industry to sustain competitiveness. The benefits that nanotechnology brings to the automotive sector include stronger and lighter materials for increased safety and reduced fuel consumption, improved engine performance and fuel consumption for gasoline powered vehicles due to nanocatalysts, fuel additives and lubricants, and more. Discusses various approaches and techniques such as nanoalloys, nanocomposites, nanocoatings, nanodevices, nanocatalysts and nanosensors used in modern vehicles. Presents the challenges and future of automotive materials. Explores how nanotechnology and nanomaterials are used to enhance the performance of materials and devices for automotive applications.

Emerging Trends in Nanotechnology IGI Global

Nanotechnology is a progressive research and development topic with large amounts of venture capital and government funding being invested worldwide. Nano mechanics, in particular, is the study and characterization of the mechanical behaviour of individual atoms, systems and structures in response to various types of forces and loading conditions. This text, written by respected researchers in the field, informs researchers and practitioners about the fundamental concepts in nano mechanics and materials, focusing on their modelling via multiple scale methods and techniques. The book systematically covers the theory behind multi-particle and nanoscale systems, introduces multiple scale methods, and finally looks at contemporary applications in nano-structured and bio-inspired materials.