

Carbon Nanotubes Present And Future Commercial Applications

Current and Future Developments in Nanomaterials and Carbon Nanotubes presents thematic volumes that highlight research in the field of nanomaterials. The book series covers the theory and application of nanomaterials including carbon nanotubes, composites, metallic nanomaterials and much more. It is essential reading to researchers interested in keeping up to date with nanomaterial applications in a wide variety of fields such as medicine, engineering and biotechnology.

This book covers a wide range of conventional and non-conventional machining processes of various composite materials, including polymer and metallic-based composites, nanostructured composites and green/natural composites. It presents state-of-the-art academic work and industrial developments in material fabrication, machining, modelling and applications, together with current practices and requirements for producing high-quality composite components. There are also dedicated chapters on physical properties and fabrication techniques of different composite material groups. The book also has chapters on health and safety considerations when machining composite materials and recycling composite materials. The contributors present machining composite materials in terms of operating conditions; cutting tools; appropriate machines; and typical damage patterns following machining operations. This book serves as a useful reference for manufacturing engineers, production supervisors, tooling engineers, planning and application engineers, and machine tool designers. It can also benefit final-year undergraduate and postgraduate students, as it provides comprehensive information on the machining of composite materials to produce high-quality final components. The book chapters were authored by experienced academics and researchers from four continents and nine countries including Canada, China, Egypt, India, Malaysia, Portugal, Singapore, United Kingdom and the USA.

Carbon Nanomaterials for Agri-food and Environmental Applications discusses the characterization, processing and applications of carbon-based nanostructured materials in the agricultural and environmental sectors. Sections discuss the synthesis and characterization of carbon nanotubes, the technological developments in environmental applications of carbon-based nanomaterials, and agri-food applications. The book also covers the toxic effects of engineered carbon nanoparticles on the environment, and in plants and animals. Finally, quality control and risk management are addressed to assess health and environmental risks. This is an applicable book for graduate students, researchers and those in industrial sectors of science and technology who want to learn more about carbon nanomaterials. Compares a range of carbon-based nanomaterials, showing how they are used for a range of agricultural and environmental applications Discusses the challenges and toxicity of different types of carbon-based nanomaterials for environmental and agricultural applications Explores when different classes of nanomaterial should be used in different environments

Carbon Nanotubes and Graphene is a timely second edition of the original *Science and Technology of Carbon Nanotubes*. Updated to include expanded coverage of the preparation, purification, structural characterization, and common application areas of single- and multi-walled CNT structures, this work compares, contrasts, and, where appropriate, unitizes CNT to graphene. This much expanded second edition reference supports knowledge discovery, production of impactful carbon research, encourages transition between research fields, and aids the formation of emergent applications. New chapters encompass recent developments in the theoretical treatments of electronic and vibrational structures, and magnetic, optical, and electrical solid-state properties, providing a vital base to research. Current and potential applications of both materials, including the prospect for large-scale synthesis of graphene, biological structures, and flexible electronics, are also critically discussed. Updated discussion of properties, structure, and morphology of biological and flexible electronic applications aids fundamental knowledge discovery Innovative parallel focus on nanotubes and graphene enables you to learn from the successes and failures of, respectively, mature and emergent partner research disciplines High-quality figures and tables on physical and mathematical applications expertly summarize key information – essential if you need quick, critically relevant data

Theoretical and Numerical Approaches

Functionalizing Graphene and Carbon Nanotubes

21st Century Nanoscience

Carbon Nanotube Science

Metals and Metal Oxides, Graphene and Carbon Nanotubes

Modeling of Carbon Nanotubes, Graphene and their Composites

This book describes various carbon nanomaterials and their unique properties, and offers a detailed introduction to graphene-carbon nanotube (CNT) hybrids. It demonstrates strategies for the hybridization of CNTs with graphene, which fully utilize the synergistic effect between graphene and CNTs. It also presents a wide range of applications of graphene-CNT hybrids as novel materials for energy storage and environmental remediation. Further, it discusses the preparation, structures and properties of graphene-CNT hybrids, providing interesting examples of three types of graphene-CNT hybrids with different nanostructures. This book is of interest to a wide readership in various fields of materials science and engineering.

A large part of the research currently being conducted in the fields of materials science and engineering mechanics is devoted to carbon nanotubes and their applications. In this process, modeling is a very attractive investigation tool due to the difficulties in manufacturing and testing of nanomaterials. Continuum modeling offers significant advantages over atomistic modeling. Furthermore, the lack of accuracy in continuum methods can be overtaken by incorporating input data either from experiments or atomistic methods. This book reviews the recent progress in continuum modeling of carbon nanotubes and their composites. The advantages and disadvantages of continuum methods over atomistic methods are comprehensively discussed. Numerical models, mainly based on the finite element method, as well as analytical models are presented in a comparative way starting from the simulation of isolated pristine and defected nanotubes and proceeding to nanotube-based composites. The ability of continuum methods to bridge different scales is emphasized. Recommendations for future research are given by focusing on what still continuum methods have to learn from the nano-scale. The scope of the book is to provide current knowledge aiming to support researchers entering the scientific area of carbon nanotubes to choose the appropriate modeling tool for accomplishing their study and place their efforts to further improve continuum methods.

The discovery of fullerenes (also known as buckyballs) has generated tremendous excitement and opened up a new field of carbon chemistry. As the first book available on this topic, this volume will be a landmark reference in the field. Because buckyballs are essentially closed hollow cages made up of carbon atoms, they can be manipulated in a variety of ways to yield never-before-seen materials. The balls can, for instance, be doped with atoms or pulled out into tubules and filled with lead to provide properties of high-temperature superconductivity. Researchers can now create their own buckyballs in a process that is almost as simple as making soot, making this research as inexpensive as it is exotic (which has doubtless contributed to its popularity). Researchers anticipate that fullerenes will offer boundless opportunities in the development of new products, drugs and materials. Science of Fullerenes and Carbon Nanotubes introduces materials scientists, chemists, and solid state physicists to the field of fullerenes, and discusses the unique properties and applications. both current and future, of all classes of fullerenes. Key Features * First comprehensive resource on fullerenes and their applications * Provides an introduction to the topic * Presents an extensive discussion of current and future applications of Fullerenes * Covers all classes of fullerenes A guide to one of the most important aspects for affordable and highly efficient dye-sensitized solar cells Dye-sensitized solar cells have the potential to be one of the most promising photovoltaic technologies for production of renewable and clean energy. Counter Electrodes for Dye-Sensitized and Perovskite Solar Cells offers an introduction to the various types of counter electrode catalysts for dye-sensitized solar cells and perovskite solar cells, including metal and metal compounds, carbon materials, polymers, and composites. With contributions from an international panel of experts, the book contains a discussion of the design and synthesis of the catalysts, characterization and stability of the devices, as well as calculations on properties. The contributors cover a wide range of topics including information on: carbon nanotubes electrocatalysts for I-mediated dye-sensitized solar cells; Pt-loaded composite electrocatalysts for I-mediated dye-sensitized solar cells; metal contact electrodes for perovskite solar cells; and much more. The book also includes insight into the future developments in the field. This important resource Covers the various types of counter electrode catalysts and presents design strategies, synthesis methods, theoretical calculation and stability evaluation Includes information on low-cost counter electrode catalysts and commercial applications of dye-sensitized sensitized solar cells Discusses how electrode catalysts can be applied in a range of fields, such as solar cells, fuel cells, hydrogen production, and photocatalysis Offers contributions from leading experts in the field including Anders Hagfeldt, one of the world's leading researchers in this field Written for materials scientists, solid state chemists, electrochemists, catalytic chemists, solid state physicists, and chemical industry professionals, Counter Electrodes for Dye-Sensitized and Perovskite Solar Cells is a comprehensive and authoritative guide to dye-sensitized solar cells.

Science, Manufacturing, Commercialization

Mechanical Engineering for Sustainable Development: State-of-the-Art Research

Mechanical Behaviors of Carbon Nanotubes

Industrial Applications of Carbon Nanotubes

Advances in Nanomaterials

Counter Electrodes for Dye-Sensitized and Perovskite Solar Cells (2 Vols.)

Nanomaterials for Hydrogen Storage Applications introduces nanomaterials and nanocomposites manufacturing and design for hydrogen storage applications. The book covers the manufacturing, design, characterization techniques and hydrogen storage applications of a range of nanomaterials. It outlines fundamental characterization techniques for

nanocomposites to establish their suitability for hydrogen storage applications. Offering a sound knowledge of hydrogen storage application of nanocomposites, this book is an important resource for both materials scientists and engineers who are seeking to understand how nanomaterials can be used to create more efficient energy storage solutions. Assesses the characterization, design, manufacture and application of different types of nanomaterials for hydrogen storage Outlines the major challenges of using nanomaterials in hydrogen storage Discusses how the use of nanotechnology is helping engineers create more effective hydrogen storage systems

Recent important discoveries and developments in nanotechnology have had a remarkable and ever-increasing impact on many industries, especially materials science, pharmaceuticals, and biotechnology. Nanocarriers have been investigated for a wide variety of different medical applications. Some examples of these nanocarriers include polymersomes, liposomes, micelles and carbon-based nanomaterials. Within this book, the authors describe different features of carbon nanotubes (CNTs), survey the properties of both the multi-walled and single-walled varieties, and cover their applications in drug and gene delivery. In addition, the book explains the structure and properties of CNTs prepared by different method, and discussed their isolation and purification. The future of CNTs in the field of biomedical science will depend on minimizing their adverse effects by careful study of their structure and properties.

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.

Nanoarchitectures Built with Carbon Nanotubes and Magnetic Nanoparticles, Volume 630, the latest volume in the Methods in Enzymology series, continues the legacy of this premier serial with quality chapters authored by leaders in the field. New chapters in this volume include updates from well-known, established leaders. Contains the authority of authors who are leaders in their field Provides a comprehensive source on new methods and research in enzymology

Their Properties and Applications

A Technical, Socioeconomic, and Environmental Approach

Perspective of Carbon Nanotubes

Synthesis, Properties and Applications

Current and Future Developments in Nanomaterials and Carbon Nanotubes

Single-Walled Carbon Nanotubes

This 21st Century Nanoscience Handbook will be the most comprehensive, up-to-date large reference work for the field of nanoscience. Handbook of Nanophysics, by the same editor, published in the fall of 2010, was embraced as the first comprehensive reference to consider both fundamental and applied aspects of nanophysics. This follow-up project has been conceived as a necessary expansion and full update that considers the significant advances made in the field since 2010. It goes well beyond the physics as warranted by recent developments in the field. Key Features: Provides the most comprehensive, up-to-date large reference work for the field. Chapters written by international experts in the field. Emphasises presentation and real results and applications. This handbook distinguishes itself from other works by its breadth of coverage, readability and timely topics. The intended readership is very broad, from students and instructors to engineers, physicists, chemists, biologists, biomedical researchers, industry professionals, governmental scientists, and others whose work is impacted by nanotechnology. It will be an indispensable resource in academic, government, and industry libraries worldwide. The fields impacted by nanoscience extend from materials science and engineering to biotechnology, biomedical engineering, medicine, electrical engineering, pharmaceutical science, computer technology, aerospace engineering, mechanical engineering, food science, and beyond.

This book presents carbon nanotubes as a potential material for the development of new waste water treatment technologies. Reviews on adsorption, catalysis, membrane, filtration and disinfection methods are provided. A special chapter presents the use of carbon nanotubes to sense and monitor water pollutants. The text underlies each technology and process as well as the current commercialization efforts. Research gaps are highlighted at the end with links to further reading material in the field.

This brief explores polysaccharides, the most abundant family of naturally occurring polymers, and explains how they have gained considerable attention in recent decades as a source of innovative bio-based materials. The authors present a range of material including an extensive array of polysaccharide hybrid nanomaterials with distinct applications. The most recent knowledge regarding polysaccharide-based hybrid nanomaterials with metal and metal oxide nanoparticles (NPs), carbon nanotubes and graphene is presented as well as the main polysaccharides, namely cellulose, chitin and chitosan, starch and their most relevant derivatives. The book features a description of important production methodologies, properties, and applications of these types of hybrids.

Carbon Nanotube-Reinforced Polymers: From Nanoscale to Macroscale addresses the advances in nanotechnology that have led to the development of a new class of composite materials known as CNT-reinforced polymers. The low density and high aspect ratio, together with their exceptional mechanical, electrical and thermal properties, render carbon nanotubes as a good reinforcing agent for composites. In addition, these simulation and modeling techniques play a significant

role in characterizing their properties and understanding their mechanical behavior, and are thus discussed and demonstrated in this comprehensive book that presents the state-of-the-art research in the field of modeling, characterization and processing. The book separates the theoretical studies on the mechanical properties of CNTs and their composites into atomistic modeling and continuum mechanics-based approaches, including both analytical and numerical ones, along with multi-scale modeling techniques. Different efforts have been done in this field to address the mechanical behavior of isolated CNTs and their composites by numerous researchers, signaling that this area of study is ongoing. Explains modeling approaches to carbon nanotubes, together with their application, strengths and limitations Outlines the properties of different carbon nanotube-based composites, exploring how they are used in the mechanical and structural components Analyzes the behavior of carbon nanotube-based composites in different conditions Functionalization and Potential Applications

Preparation, Properties and Applications

Fundamentals of Conjugated Polymer Blends, Copolymers and Composites

Nanoarmoring of Enzymes with Carbon Nanotubes and Magnetic Nanoparticles

Advanced Nanomaterials for Wastewater Remediation

Production, Properties and Applications in Smart Textiles

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

Nanotechnology is changing the world in a very big way, but at the atomic and sub-atomic level. Although the roots of nanotechnology can be traced back to more than a century ago, the last three decades have witnessed an explosion of nano-based technologies and products. This reference work examines the history, current status, and future directions of nanotechnology through an exhaustive search of the technical and scientific literature. The more than 4000 bibliographic citations it includes are carefully organized into core subject areas, and a geographic and subject index allows readers to quickly locate documents of interest. Although a sense of the global reach and interest in nanotechnology can be gleaned from the reference sections of countless journal articles, conference papers, and books, this is the only reference work providing an in-depth global perspective that is ready-made for nanotechnology professionals and those interested in learning more about all things nanotechnology. Despite the abundance of online resources, there is still an urgent need for well-researched, well-presented, concise, and thematically organized reference works. Instead of relying on wiki pages, citation aggregators, and related websites, the author searched the databases and databanks of scholarly literature search providers such as EBSCO, ProQuest, PUBMED, STN International, and Thomson Reuters. In addition, he used select serials-related databases to account for pertinent documents from countries in which English is not the primary national language (i.e., China Online Journals, e-periodica, J-STAGE, and SciELO Brazil among others).

This exploratory textbook starts with fundamentals that satisfy the needs of a diverse group of educators, researchers and students aspiring to engage in research and engineering of nanomaterials. It bridges the gap between undergraduate students in science and engineering who have not yet chosen a specific career path, graduate students still considering different disciplines and the cross-cutting scientific topics in nanomaterials. It extends to methods of common practice in the field, spanning experimental, and theoretical techniques. The extensive use of nanomaterials, such as carbon nanotubes, in the future of global technological solutions underscores the relevance of this text aimed at students and researchers with a range of interests. "Advances in Nanomaterials: Fundamentals, Properties and Applications," is ideal for senior undergraduate and graduate students, faculty and general science enthusiasts interested in nanomaterials across contexts ranging from solar energy, structural engineering, to medical devices, to semiconductors.

This volume provides valuable insight into diverse topics related to mechanical engineering and presents state-of-the-art work on sustainable development being carried out throughout the world by budding researchers and scientists. Divided into three sections, the volume covers machine design, materials and manufacturing, and thermal engineering. It presents innovative research work on machine design that is of relevance to such varied fields as the automotive industry, agriculture, and human anatomy. The second section addresses materials characterization, an important tool in assessing proper materials for application-oriented jobs, and emerging unconventional machining processes that are important in design engineering for new products and tools. The section on thermal engineering broadly covers the use of viable alternate fuels, such as HHO, biodiesel, etc., with the objective of reducing the burden on petroleum reserves and the environment.

Advanced Ceramic Materials

CNT Polymer Science and Technology

Quantum Chemistry of Nanotubes

Desalination Sustainability

Carbon Nanotube-Reinforced Polymers

Nanotechnology in Aerospace and Structural Mechanics

In this book, meshes and networks formed out of multiwalled carbon nanotubes are investigated and analyzed, including their use in niche applications such as electro-optic devices, advanced mechanical, thermal and electrical property enhancement, and gene editing. Different properties of multi-walled carbon nanotubes, including random network formation, ordering the meshes and networks by mechanical agitation and application of an external field, using crystallization and cross-linking induced phase separation in homopolymers-CNT composites are discussed with theoretical analysis. The book is aimed at researchers and graduate students in Electrical Engineering; Materials Science and Engineering; Chemical Engineering and Nanotechnology, Electronic circuit design, manufacturing, and characterization.

Nanotube Superfiber Materials: Science, Manufacturing, Commercialization, Second Edition, helps engineers and entrepreneurs understand the science behind the unique properties of nanotube fiber materials, how to efficiently and safely produce them, and how to transition them into commercial products. Each chapter gives an account of the basic science, manufacturing, properties and commercial potential of a specific nanotube material form and its application. New discoveries and technologies are explained, along with experiences in handing-off the improved materials to industry. This book spans nano-science, nano-manufacturing, and the commercialization of nanotube superfiber materials. As such, it opens up the vast commercial potential of nanotube superfiber materials. Applications for nanotube superfiber materials cut across most of the fields of engineering, including spacecraft, automobiles, drones, hyperloop tracks, water and air filters, infrastructure, wind energy, composites, and medicine where nanotube materials enable development of tiny machines that can work inside our bodies to diagnose and treat disease. Provides up to date information on the applications of nanotube fiber materials Explores both the manufacturing and commercialization of nanotube superfibers Sets out the processes for producing macro-scale materials from carbon nanotubes Describes the unique properties of these materials

Electrochemical Membrane Technology for Water and Wastewater Treatment consolidates state-of-the-art research developments in electrochemical membrane technology in water reclamation and sustainability in terms of fundamental theories, membrane and electrode materials, reactor designs, and fouling control mechanisms and applications. Fundamental theories and applications of electrochemical membrane technology are detailed, with emerging applications of electrochemical membrane technology introduced. The knowledge gaps and future research perspectives in electrochemical membrane technology are also addressed. This book is an excellent resource for understanding fundamental theories, the latest developments, and future prospects in electrochemical membrane technology. The concepts presented in this book can benefit a broad audience of researchers and engineers working in water purification, membrane technology and electrochemical process. Consolidates scattered knowledge of electrochemical membrane technology into a more assessible resource Provides a comprehensive review of fundamental theories, membrane materials and module design as well as the latest developments in electrochemical membrane technology Provides a state-of-the-art review on the applications of electrochemical membrane technology Includes detailed discussions on the challenges and prospects of electrochemical membrane technology in different applications Presents an excellent reference for the education and understanding of water treatment, wastewater treatment, membrane technology, electrochemical technology, environmental science and technology, and the latest research and developments

Carbon nanotubes belong to new nanomaterials and have been known for almost 20 years, but their history is somewhat lengthier. They have been identified as promising candidates for various applications. High-temperature preparation techniques are conventional techniques for the synthesis of carbon nanotubes using arc discharge or laser ablation, but today these methods are being replaced by low-temperature vapor deposition techniques, since orientation, alignment, nanotube length, diameter, purity, and density of carbon nanotubes can be precisely controlled. The synthesis of carbon nanotubes by chemical vapor deposition on catalyst arrays leads to nanotube models grown from specific sites on surfaces. The controlled synthesis of nanotubes opens up interesting possibilities in nanoscience and nanotechnologies, including electrical, mechanical and electromechanical properties and devices, chemical functionalization, surface chemistry and photochemistry, molecular sensors, and interfacing with moderate biological systems. Carbon nanotubes are used in many applications due to their unique electrical, mechanical, optical, thermal, and other properties. Conductive and high-strength composite materials, energy saving and energy conversion devices, sensors, visualization of field emissions and sources of radiation, means for storing hydrogen, and nanoscale semiconductor devices, probes, and interconnections are some of the many applications of carbon nanotubes.

Carbon Nanotubes

Carbon Nanotube Fibres and Yarns

Carbon Nanomaterials for Agri-food and Environmental Applications

From Nanoscale to Macroscale

The Nanotechnology Revolution

Science of Fullerenes and Carbon Nanotubes

This book compiles all current information on the different types of functionalization of carbon nanotubes (CNTs) and graphene, both covalent and non-covalent. The book starts with a general overview of the synthesis, characterization and application of functionalized CNTs and graphene. Special attention is dedicated to the characterization of functionalized materials, a topic rarely addressed on the literature. The authors provide a comparison between the functionalization of these two types of carbon materials.

Carbon Nanotube Fibres and Yarns for Smart Textiles: Production, Properties and Applications in Smart Textiles explains the relevance of carbon nanotube science and provides new insights on this emerging, high-performance textile material. Particular emphasis is placed on applications in smart textiles and wearable electronics applications, such as

flexible sensors, actuators and energy sources. This collection examines the state-of-the-art in carbon nanotube (CNT) research, providing guidance for anyone who is exploring problems where CNTs may provide design solutions. Finally, the book addresses advances in yarn spinning methods, yarn structures and properties. Drawing on his experience in the textile industry, the book's editor presents academic research in a way that is comprehensible and useful to materials scientists and engineers in practice. Explains how carbon nanotube science can meet the challenging requirements of important and emerging smart textiles and wearable electronics applications Reviews and analyzes key developments on CNT yarn spinning methods, yarn structures and properties, and proposed applications Addresses the potential applications of CNT yarns and nanocomposite fibers

This new book discusses a selection of advanced topics on carbon nanotubes—their extraordinary properties, structure, design, fabrication, development, engineering, functionalization, carbon nanotube enabled nanocomposites, characterization, and, moreover, their utility in many applications. The volume highlights the amazing potential of advanced CNT composites in automotive, aeronautics, spacecrafts, transistors replacing Si electronics, energy, purification, hydrogen storage, tissue regeneration, electrochemical supercapacitors, sensing, biomedical applications, agriculture, energy, and technical applications. The book specifically discusses the applications of carbon nanotubes for a greener environment, as well as applications for biomedical uses, in drug delivery, and in display technology. It also explores the uses of CNTs in the energy and aerospace industries, such as for solar energy conversion, as a lubricant additive for enhancing energy efficiency, and more. Other chapters explore the potential of carbon nanotubes in hydrogen storage and carbon nanotube electronics.

Carbon Nanotube Reinforced Composites introduces a wide audience of engineers, scientists and product designers to this important and rapidly expanding class of high performance composites. Dr Loos provides readers with the scientific fundamentals of carbon nanotubes (CNTs), CNT composites and nanotechnology in a way which will enable them to understand the performance, capability and potential of the materials under discussion. He also investigates how CNT reinforcement can be used to enhance the mechanical, electrical and thermal properties of polymer composites.

Production methods, processing technologies and applications are fully examined, with reference to relevant patents. Finally, health and safety issues related to the use of CNTs are investigated. Dr. Loos compares the theoretical expectations of using CNTs to the results obtained in labs, and explains the reasons for the discrepancy between theoretical and experimental results. This approach makes the book an essential reference and practical guide for engineers and product developers working with reinforced polymers – as well as researchers and students in polymer science, materials and nanotechnology. A wealth of applications information is included, taken from the wide range of industry sectors utilizing CNT reinforced composites, such as energy, coatings, defense, electronics, medical devices, and high performance sports equipment. Introduces a wide range of readers involved in plastics engineering, product design and manufacturing to the relevant topics in nano-science, nanotechnology, nanotubes and composites. Assesses effects of CNTs as reinforcing agents, both in a materials context and an applications setting. Focuses on applications aspects – performance, cost, health and safety, etc – for a wide range of industry sectors, e.g. energy, coatings, defense, electronics, medical devices, high performance sports equipment, etc.

Electrochemical Membrane Technology for Water and Wastewater Treatment

Advances in Machining of Composite Materials

Polysaccharide Based Hybrid Materials

Integrating Theory and Technique

Graphene-Carbon Nanotube Hybrids for Energy and Environmental Applications

Conventional and Non-conventional Processes

Carbon nanotubes, with their extraordinary engineering properties, have garnered much attention in the past 10 years. Because of the broad range of potential applications, the scientific community is more motivated than ever to move beyond basic properties and explore the real issues associated with carbon nanotube-based applications. Presenting up-to-date literature that presents the current state of the science, this book, *Engineered Carbon Nanotubes and Nanofibrous Material: Integrating Theory and Technique*, fully explores the development phase of carbon nanotube-based applications. It looks at carbon nanotubes and their applications in diverse areas of science and engineering and considers environmental engineering applications as well. This volume is a valuable resource for engineers, scientists, researchers, and professionals in a wide range of disciplines whose focus remains on the power and promise of carbon nanotubes.

Since their discovery in 1977, the evolution of conducting polymers has revolutionized modern science and technology. These polymers enjoy a special status in the area of materials science yet they are not as popular among young readers or common people when compared to other materials like metals, paper, plastics, rubber, textiles, ceramics and composites like concrete. Most importantly, much of the available literature in the form of papers, specific review articles and books is targeted either at advanced readers (scientists/technologists/engineers/senior academicians) or for those who are already familiar with the topic (doctoral/postdoctoral scholars). For a beginner or even school/college students, such compilations are bit difficult to access/digest. In fact, they need proper introduction to the topic of conducting polymers including their discovery, preparation, properties, applications and societal impact, using suitable examples and already known principles/knowledge/phenomenon. Further, active participation of readers in terms of “question & answers”, “fill-in-the-blanks”, “numerical” along with suitable answer key is necessary to maintain the interest and to initiate the “thought process”. The readers also need to know about the drawbacks and any hazards of such materials. Therefore, I believe that a comprehensive source on the science/technology of conducting polymers which maintains a link between grass root fundamentals and state-of-the-art R&D is still missing from the open literature.

Desalination Sustainability: A Technical, Socioeconomic, and Environmental Approach presents a technical, socioeconomical, and environmental approach that guides researchers and technology developers on how to quantify the energy efficiency of a proposed desalination process using thermodynamics-based tools. The book offers the technical reader an understanding of the issues related to desalination sustainability. For example, technology users, such as public utility managers will gain the ability and tools to assess whether or not desalination is a good choice for a city or country. Readers will learn new insights on a clear and practical methodology on how to probe the economic feasibility of desalination using simple and effective tools, such as levelized cost of water (LCOW) calculation. Decision-makers will find this book to be a valuable resource for the preliminary assessment of whether renewable-powered desalination is a good choice for their particular setting. Presents the issues related to desalination sustainability Guides researchers and technology developers on how to quantify the energy efficiency of a proposed desalination process using thermodynamics-based tools Outlines a clear and practical methodology on how to probe the economic feasibility of desalination using simple and effective tools Provides a roadmap for decision-makers on the applicability of a desalination process at a particular setting

The series **Topics in Current Chemistry Collections** presents critical reviews from the journal **Topics in Current Chemistry** organized in topical volumes. The scope of coverage is all areas of chemical science including the interfaces with related disciplines such as biology, medicine and materials science. The goal of each thematic volume is to give the non-specialist reader, whether in academia or industry, a comprehensive insight into an area where new research is emerging which is of interest to a larger scientific audience. Each review within the volume critically surveys one aspect of that topic and places it within the context of the volume as a whole. The most significant developments of the last 5 to 10 years are presented using selected examples to illustrate the principles discussed. The coverage is not intended to be an exhaustive summary of the field or include large quantities of data, but should rather be conceptual, concentrating on the methodological thinking that will allow the non-specialist reader to understand the information presented. Contributions also offer an outlook on potential future developments in the field.

Current Progress of their Polymer Composites

Carbon Nanotubes for Clean Water

Carbon Nanotubes in Drug and Gene Delivery

Nanomaterials for Hydrogen Storage Applications

Synthesis, Properties, and Applications

Introduction to carbon nanomaterials

This book includes selected conference proceedings of Conference on Processing and Characterization of Materials (CPCM-2020). The content of the book includes processing of and characterization of materials, sustainable energy materials, defense materials, functionally graded materials, and composites which has significant impact on cutting-edge applications. The book also includes surface engineering, computational methods and materials, waste utilization, and corrosion and environmental degradation of materials. Design, research, and development studies, experimental investigations, theoretical analysis, and fabrication techniques relevant to the application of materials in various assemblies, ranging from individual components to complete structure are presented in the book. The book is useful for graduate students, researchers, and industry professionals alike.

This book shows the recent advances of the applications of carbon nanotubes (CNTs), in particular, the polymer functionalized carbon nanotubes. It also includes a comprehensive description of carbon nanotubes' preparation, properties, and characterization. Therefore, we have attempted to provide detailed information about the polymer-carbon nanotube composites. With regard to the unique structure and properties of carbon nanotubes, a series of important findings have been reported. The unique properties of carbon nanotubes, including thermal, mechanical, and electrical properties, after polymer functionalization have been documented in detail. This book comprises 18 chapters. The chapters include different applications of polymer functionalization CNTs, e.g. photovoltaic, biomedical, drug delivery, gene delivery, stem cell therapy, thermal therapy, biological detection and imaging, electroanalytical, energy, supercapacitor, and gas sensor applications.

This book gives a detailed and up-to-date overview of the linearized augmented cylindrical wave (LACW) technique for nanotubes and nanowires. The author presents the mathematical foundations together with numerous applications. Method for calculating the electronic structure of point impurities, which is based on a combination of the LACW and Green's functions techniques, is presented. The book clearly demonstrates how the relativistic effects can be incorporated into LACW approach and how the spin-orbit coupling effects change the tubules band structure. Extensive illustrations of application to the inorganic nanotubes and nanowires make the book essential reading in this field above all.

Contamination of aqueous environments by hazardous chemical compounds is the direct cause of the decline of safe clean water supply throughout the globe. The use of unconventional water sources such as treated wastewater will be a new norm. Emerging nanotechnological innovations have great potential for wastewater remediation processes. Applications that use smart nanomaterials of inorganic and organic origin improve treatment efficiency and lower energy requirements. This book describes the synthesis, fabrication, and application of advanced nanomaterials in water treatment processes; their adsorption, transformation into low toxic forms, or degradation phenomena, and the adsorption and separation of hazardous dyes, organic pollutants, heavy metals and metalloids from aqueous solutions. It explains the use of different categories of nanomaterials for various pollutants and enhances understanding of nanotechnology-based water remediation to make it less toxic and reusable.

Processing and Characterization of Materials

Electronic Cylindrical Waves

A Handbook (Ten-Volume Set)

Organized Networks of Carbon Nanotubes

Fundamentals, Properties and Applications

Engineered Carbon Nanotubes and Nanofibrous Material

Provides coverage of all of the important aspects of carbon nanotube research, including synthesis, properties and potential applications.

Industrial Applications of Carbon Nanotubes covers the current applications of carbon nanotubes in various industry sectors, from the military to visual display products, and energy harvesting and storage. It also assesses the opportunities and challenges for increased commercialization and manufacturing of carbon nanotubes in the years ahead. Real-life case studies illustrate how carbon nanotubes

are used in each industry sector covered, providing a valuable resource for scientists and engineers who are involved and/or interested in carbon nanotubes in both academia and industry. The book serves as a comprehensive guide to the varied uses of carbon nanotubes for specialists in many related fields, including chemistry, physics, biology, and textiles. Explains how carbon nanotubes can be used to improve the efficiency and performance of industrial products Includes real-life case studies to illustrate how carbon nanotubes have been successfully employed Explores how carbon nanotubes could be mass-manufactured in the future, and outlines the challenges that need to be overcome

Mechanical Behaviors of Carbon Nanotubes: Theoretical and Numerical Approaches presents various theoretical and numerical studies on mechanical behaviors of carbon nanotubes. The main theoretical aspects included in the book contain classical molecular dynamics simulation, atomistic-continuum theory, atomic finite element method, continuum plate, nonlocal continuum plate, and shell models. Detailed coverage is also given to structural and elastic properties, trace of large deformation, buckling and post-buckling behaviors, fracture, vibration characteristics, wave propagation, and the most promising engineering applications. This book not only illustrates the theoretical and numerical methods for analyzing the mechanical behavior of carbon nanotubes, but also contains computational results from experiments that have already taken place. Covers various theoretical and numerical studies, giving readers a greater understanding of the mechanical behavior of carbon nanotubes Includes multiscale methods that provide the advantages of atomistic and continuum approaches, helping readers solve complex, large-system engineering problems Allows engineers to create more efficient carbon nanotube structures and devices

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