

Nanocomposites Synthesis Structure Properties And New

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

With the advent of polymer nanocomposites, research on polyolefin nanocomposites has grown exponentially. Correcting the deficiency of a meaningful text on these important materials, **Advances in Polyolefin Nanocomposites: Sums up recent advances in nanoscale dispersion of filler in polyolefins** Presents a basic introduction to polyolefin nanocomposite technology for the readers new to this field Provides insights on the use of technologies for polyolefins nanocomposites for commercial application Includes contributions from the most experienced researchers in the field Offers insights into the commercial usage of techniques The text uses theoretical models to illustrate the organic-inorganic interfaces in polyolefins and also provides a detailed description of the recently developed models for property prediction of these nanocomposites. It concentrates on developments with not only aluminosilicate fillers, but also with equally important fillers like layer double hydroxides and nanotubes. The authors review polyolefin nanocomposite technology and methodologies of generation, properties and generation of composite blends, and advances in synthesis of nanocomposites using solution blending methods. The book covers theoretical and experimental considerations of clay surface modification and the importance and effect of various prominent filler categories.

Clay-Containing Polymer Nanocomposites covers everything from fundamental understanding to real applications of clay-containing polymer nanocomposites, including environmental considerations. The book's coverage of fundamentals and generalities, in addition to in-depth coverage of polymer layered silicate nanocomposites, make it a valuable companion for beginners in the field as well as more seasoned researchers. This book provides a rare coherent approach to this class of materials. This title is ideal for polymer and material scientists, researchers, and engineers, including under- and post-graduate students who are interested in this exciting field of research. This book will also help industrial researchers and R&D managers who want to bring advanced polymeric material based products into the market. Details crystallization behavior and kinetics to aid in applications such as injection molding Covers melt-state rheological properties, aiding understanding of the processability of materials Presents applications and market potential, supporting R&D managers who want to bring advanced polymeric material-based products into the market.

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.

This Special Issue deals with the fascinating material class of nanocomposites consisting of extremely small particles (nanoparticles) which are embedded in polymers. Such materials are of paramount interest in various disciplines, especially chemistry, physics, biomedicine and materials science. Due to the diversity of the components of nanocomposites, they provide a broad spectrum of material properties and applications. The versatility of nanocomposites is indeed reflected by the research covered in this Special Issue. The field of nanocomposites includes innovative science and a source of inspiration for currently relevant economic topics as well as for envisaged technologies of the future. Indeed, this volume alludes to strategies for the preparation of nanocomposites and possibilities for a variety of applications, such as catalytic reactions, gas barriers, high refractive index materials, corrosion protection, electromagnetic interference (EMI) shielding, lithium ion batteries, tissue engineering and plastic surgery.

With its focus on the characterization of nanocomposites using such techniques as x-ray diffraction and spectrometry, light and electron microscopy, thermogravimetric analysis, as well as nuclear magnetic resonance and mass spectroscopy, this book helps to correctly interpret the recorded data. Each chapter introduces a particular characterization method, along with its foundations, and makes the user aware of its benefits, but also of its drawbacks. As a result, the reader will be able to reliably predict the microstructure of the synthesized polymer nanocomposite and its thermal and mechanical properties, and so assess its suitability for a particular application. Belongs on the shelf of every product engineer.

This book would serve as a comprehensive review treatise on recent advances in nanomaterials and nanotechnology including synthesis, properties and applications of nanomaterials in varied fields. Focussing is on top-down and bottom-up approaches for the synthesis of nanomaterials included, the book covers most commonly used characterization tool

Polymer-layered Silicate Nanocomposites Synthesis, Structure and Properties The Synthesis, Structure and Properties of Polypropylene Nanocomposites Nanocrystalline Materials Their Synthesis-Structure-Property Relationships and Applications Newnes

Glass Nanocomposites: Synthesis, Properties and Applications provides the latest information on a rapidly growing field of specialized materials, bringing light to new research findings that include a growing number of technologies and applications. With this growth, a new need for deep understanding of the synthesis methods, composite structure, processing and application of glass nanocomposites has emerged. In the book, world renowned experts in the field, Professors Karmakar, Rademann, and Stepanov, fill the knowledge gap, building a bridge between the areas of

nanoscience, photonics, and glass technology. The book covers the fundamentals, synthesis, processing, material properties, structure property correlation, interpretation thereof, characterization, and a wide range of applications of glass nanocomposites in many different devices and branches of technology. Recent developments and future directions of all types of glass nanocomposites, such as metal-glasses (e.g., metal nanowire composites, nanoglass-mesoporous silica composites), semiconductor-glass and ceramic-glass nanocomposites, as well as oxide and non-oxide glasses, are also covered in great depth. Each chapter is logically structured in order to increase coherence, with each including question sets as exercises for a deeper understanding of the text. Provides comprehensive and up-to-date knowledge and literature review for both the oxide and non-oxide glass nanocomposites (i.e., practically all types of glass nanocomposites) Reviews a wide range of synthesis types, properties, characterization, and applications of diverse types of glass nanocomposites Presents future directions of glass nanocomposites for researchers and engineers, as well as question sets for use in university courses

Advances in Polymer Science enjoys a longstanding tradition and good reputation in its community. Each volume is dedicated to a current topic and each review critically surveys one aspect of that topic, to place it within the context of the volume. The volumes typically summarize the significant developments of the last 5 to 10 years and discuss them critically, presenting selected examples, explaining and illustrating the important principles and bringing together many important references of primary literature. On that basis, future research directions in the area can be discussed.

Advances in Polymer Science volumes thus are important references for every polymer scientist, as well as for other scientists interested in polymer science - as an introduction to a neighboring field, or as a compilation of detailed information for the specialist.

The series Advances in Polymer Science presents critical reviews of the present and future trends in polymer and biopolymer science. It covers all areas of research in polymer and biopolymer science including chemistry, physical chemistry, physics, material science. The thematic volumes are addressed to scientists, whether at universities or in industry, who wish to keep abreast of the important advances in the covered topics. Advances in Polymer Science enjoys a longstanding tradition and good reputation in its community. Each volume is dedicated to a current topic, and each review critically surveys one aspect of that topic, to place it within the context of the volume. The volumes typically summarize the significant developments of the last 5 to 10 years and discuss them critically, presenting selected examples, explaining and illustrating the important principles, and bringing together many important references of primary literature. On that basis, future research directions in the area can be discussed. Advances in Polymer Science volumes thus are important references for every polymer scientist, as well as for other scientists interested in polymer science - as

an introduction to a neighboring field, or as a compilation of detailed information for the specialist. Review articles for the individual volumes are invited by the volume editors. Single contributions can be specially commissioned. Readership: Polymer scientists, or scientists in related fields interested in polymer and biopolymer science, at universities or in industry, graduate students

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This second edition of Nanocrystalline Materials provides updated information on the development and experimental work on the synthesis, properties, and applications of nanocrystalline materials. Nanocrystalline materials with new functionalities show great promise for use in industrial applications — such as reinforcing fillers in novel polymer composites — and substantial progress has been made in the past decade in their synthesis and processing. This book focuses primarily on 1D semiconducting oxides and carbon nanotubes, 2D graphene sheets and 0D nanoparticles (metals and inorganic semiconductors). These materials are synthesized under different compositions, shapes and structures, exhibiting different chemical, physical and mechanical properties from their bulk counterparts. This second edition presents new topics relevant to the fast-paced development of nanoscience and nanotechnology, including the synthesis and application of nanomaterials for drug delivery, energy, printed flash memory, and luminescent materials. With contributions from leading experts, this book describes the fundamental theories and concepts that illustrate the complexity of developing novel nanocrystalline materials, and reviews current knowledge in the synthesis, microstructural characterization, physical and mechanical behavior, and application of nanomaterials. Investigates the synthesis, characterization, and properties of a large variety of nanocrystalline materials, and their applications in industry Keeps the prominent challenges in nanomaterials fabrication at the forefront while offering the most up-to-date scientific findings Written by experts in nanomaterials with academic backgrounds in chemistry, physics, and materials engineering This book offers an unparalleled source of information on in vivo assessment of nanoparticle toxicity by using *Drosophila* as a model organism. Nanoparticles have emerged as an useful tool for wide variety of biomedical, cosmetics, and

industrial applications. However, our understanding of nanomaterial-mediated toxicity under in vivo condition remains limited. The book begins with a chapter on synthesis and characterization of nanoparticles used for various biological, medical and commercial purposes. The rest of the chapters deal with the impact of nanoparticles on different biological aspects like behavior, physiology and metabolic homeostasis using *Drosophila* as a model organism. Lastly, the book summarizes how proper characterization and evaluation of safe dosage of nanoparticles can be a boon if incorporated in consumer goods and for biomedical applications. Overall, the book pursues an interdisciplinary approach by connecting nanotechnology and biology from various angles using *Drosophila* as a model system, so as to develop more efficient, safe and effective use of nanoparticles for human beings.

This book provides an overview of the latest developments in biobased materials and their applications in food packaging. Written by experts in their respective research domain, its thirteen chapters discuss in detail fundamental knowledge on bio based materials. It is intended as a reference book for researchers, students, research scholars, academicians and scientists seeking biobased materials for food packaging applications.

The book "Advances in Nanocomposite Technology" contains 16 chapters divided in three sections. Section one, "Electronic Applications", deals with the preparation and characterization of nanocomposite materials for electronic applications and studies. In section two, "Material Nanocomposites", the advanced research of polymer nanocomposite material and polymer-clay, ceramic, silicate glass-based nanocomposite and the functionality of graphene nanocomposites is presented. The Human and Bioapplications section is describing how nanostructures are synthesized and draw attention on wide variety of nanostructures available for biological research and treatment applications. We believe that this book offers broad examples of existing developments in nanocomposite technology research and an excellent introduction to nanoelectronics, nanomaterial applications and bionanocomposites.

This book describes the different methodologies for producing and synthesizing silver nanoparticles (AgNPs) of various shapes and sizes. It also provides an in-depth understanding of the new methods for characterizing and modifying the properties of AgNPs as well as their properties and applications in various fields. This book is a useful resource for a wide range of readers, including scientists, engineers, doctoral and postdoctoral fellows, and scientific professionals working in specialized fields such as medicine, nanotechnology, spectroscopy, analytical chemistry diagnostics, and plasmonics.

Advances in Nanocomposites - Synthesis, Characterization and Industrial Applications was conceived as a comprehensive reference volume on various aspects of functional nanocomposites for engineering technologies. The term functional nanocomposites signifies a wide area of polymer/material science and engineering, involving the design, synthesis and study of nanocomposites of increasing structural sophistication and complexity useful for a wide range of chemical, physicochemical and biological/biomedical processes. "Emerging technologies" are also broadly understood to include new technological developments, beginning at the forefront of conventional industrial practices and extending

into anticipated and speculative industries of the future. The scope of the present book on nanocomposites and applications extends far beyond emerging technologies. This book presents 40 chapters organized in four parts systematically providing a wealth of new ideas in design, synthesis and study of sophisticated nanocomposite structures.

This book presents emerging economical and environmentally friendly polymer composites that are free of the side effects observed in traditional composites. It focuses on eco-friendly composite materials using granulated cork, a by-product of the cork industry; cellulose pulp from the recycling of paper residues; hemp fibers; and a range of other environmentally friendly materials procured from various sources. The book presents the manufacturing methods, properties and characterization techniques of these eco-friendly composites. The respective chapters address classical and recent aspects of eco-friendly polymer composites and their chemistry, along with practical applications in the biomedical, pharmaceutical, automotive and other sectors. Topics addressed include the fundamentals, processing, properties, practicality, drawbacks and advantages of eco-friendly polymer composites. Featuring contributions by experts in the field with a variety of backgrounds and specialties, the book will appeal to researchers and students in the fields of materials science and environmental science. Moreover, it fills the gap between research work in the laboratory and practical applications in related industries.

Nanotechnology is expected to bring revolutionary changes in a variety of fields. This volume describes nanoparticles and their biomedical applications, and covers metal nanoparticles, metal oxide nanoparticles, rare earth based nanoparticles and graphene oxide nanoparticles. It elaborates on a number of biomedical applications, including therapeutic applications. It addresses the topic of green synthesis, in view of increasing health and environmental concerns.

This book examines the current state of the art, new challenges, opportunities, and applications in the area of polymer nanocomposites. Special attention has been paid to the processing-morphology-structure-property relationship of the system. Various unresolved issues and new challenges in the field of polymer nanocomposites are discussed. The influence of preparation techniques (processing) on the generation of morphologies and the dependence of these morphologies on the properties of the system are treated in detail. This book also illustrates different techniques used for the characterization of polymer nanocomposites. The handpicked selection of topics and expert contributors across the globe make this survey an outstanding resource reference for anyone involved in the field of polymer nanocomposites for advanced technologies.

The two volumes of Handbook of Gas Sensor Materials provide a detailed and comprehensive account of materials for gas sensors, including the properties and relative advantages of various materials. Since these sensors can be applied for the automation of myriad industrial processes, as well as for everyday monitoring of such activities as public safety, engine performance, medical therapeutics, and in many other situations, this handbook is of great value. Gas sensor designers will find a treasure trove of material in these two books.

Polysiloxanes are the most studied inorganic and semi-inorganic polymers because of their many medical and commercial uses. The Si-O backbone endows polysiloxanes with intriguing properties: the strength of the Si-O bond imparts considerable thermal stability, and the nature of the bonding imparts low surface free energy. Prostheses, artificial organs, objects for facial reconstruction, vitreous substitutes in the eyes, and tubing take advantage of the stability and pliability of polysiloxanes. Artificial skin, contact lenses, and drug delivery systems utilize their high permeability. Such biomedical applications have led to biocompatibility studies on the interactions of polysiloxanes with proteins, and there has been interest in modifying these materials to improve their suitability for general biomedical application. Polysiloxanes examines novel aspects of polysiloxane science and engineering, including properties, work in progress, and important unsolved problems. The

volume, with ten comprehensive chapters, examines the history, preparation and analysis, synthesis, characterization, and applications of these polymeric materials.

This book provides a comprehensive overview of state-of-the-art applications of nanotechnology in biology and medicine, as well as model organisms that can help us understand the biological activity and associated toxicity of nanoparticles, and devise strategies to minimize toxicity and enhance therapies. Thanks to their high surface-to-volume ratio, nanoparticles are characterized by excellent biocompatibility and bioavailability, a high therapeutic index, and relatively low toxicity, which has led to their widespread application in the early diagnosis of diseases, comprehensive monitoring of disease progression, and improved therapeutics. The book also explores nanoparticle-based insecticides and their mechanisms of action, and provides a comparative analysis of the various model organisms that are used to understand the biological properties of nanoparticles. Further, it describes various in-vivo models that yield important insights into nanomaterial-mediated toxicity, promoting the optimal utilization of nanoparticles. In closing, the book discusses future perspectives and regulatory issues concerning the use of nanomaterials in translational research.

Nanocomposite coatings have various properties that can be utilized for corrosion protection and tribological improvements. Synthesis of the nanocomposite coatings using an electrodeposition method allows unique control of the experimental parameters. By fine tuning the experimental parameters, various compositions and properties can be obtained for the nanocomposite coatings. This book covers some of the electrochemical methods used for nanocomposite coating deposition as well as discusses in detail examples of several nanocomposite coating. The corrosion and tribological performance of the nanocomposite coatings are also covered and some nanocomposite coatings are discussed for specific technological areas, such as fuel cells and microelectronics.

The field of polymer nanocomposites has become essential for engineering and military industries over the last few decades as it applies to computing, sensors, biomedical microelectronics, hard coating, and many other domains. Due to their outstanding mechanical and thermal features, polymer nanocomposite materials have recently been developed and now have a wide range of applications. Polymer Nanocomposites for Advanced Engineering and Military Applications provides emerging research on recent advances in the fabrication methods, properties, and applications of various nano-fillers including surface-modification methods and chemical functionalization. Featuring coverage on a broad range of topics such as barrier properties, biomedical microelectronics, and matrix processing, this book is ideally designed for engineers, industrialists, chemists, government officials, military professionals, practitioners, academicians, researchers, and students.

Computational chemistry is a science that allows researchers to study, characterize and predict the structure and stability of chemical systems. In other words: studying energy differences between different states to explain spectroscopic properties and reaction mechanisms at the atomic level. This field is gaining in relevance and strength due to field applications from chemical engineering, electrical engineering, electronics, biomedicine, biology, materials science, to name but a few. Structural Analysis using Computational Chemistry arises from the need to present the progress of computational chemistry in various application areas. Technical topics discussed in the book include:

Quantum mechanics and structural molecular study (AM1)Application of quantum models in molecular analysisMolecular analysis of insulin through controlled adsorption in hydrogels based on chitosanAnalysis and molecular characterization of organic materials for application in solar cellsDetermination of thermodynamic properties of ionic liquids through molecular simulation

Through detailed case studies of the most important advanced material creations of the latter 20th and early 21st century, the author explores

the role of the field of advanced materials in the technological and economic activity today, with implications to the innovation process in general. A comprehensive study that encompasses the three major categories of advanced material technologies, i.e., Structural Materials (metals and polymers), Functional Materials (transistor, microchip and semiconductor laser) and Hybrid and New Forms of Matter (liquid crystals and nanomaterials). Extensive use of primary sources, including unpublished interviews with the scientists, engineers, and entrepreneurs on the front lines of advanced materials creation Original approach to case study narrative, emphasizing interaction between the advanced material process, perceived risk and directing and accelerating breakthrough technology

Nanocomposites are attractive to researchers both from practical and theoretical point of view because of combination of special properties. Many efforts have been made in the last two decades using novel nanotechnology and nanoscience knowledge in order to get nanomaterials with determined functionality. This book focuses on polymer nanocomposites and their possible divergent applications. There has been enormous interest in the commercialization of nanocomposites for a variety of applications, and a number of these applications can already be found in industry. This book comprehensively deals with the divergent applications of nanocomposites comprising of 22 chapters.

NANOCOMPOSITES : Microstructure, Properties, Synthesis & Applications - explains all about nanocomposites, a high performance material. It exhibit : unusual property combinations, unique design possibilities, high annual growth rate, and fastest demand in several areas of applications. In this book, a brief note on the three types of matrix nanocomposites are presented underlining the need for these materials, their processing methods and some recent results on structure, properties and potential applications, perspectives including need for such materials in future space mission and other interesting applications together with market and safety aspects.

Nanocellulose, a unique and promising natural material extracted from native cellulose, has received immense interest for its broad spectrum of applications owing to its remarkable physical properties, special surface chemistry, and excellent biological properties (biocompatibility, biodegradability and low toxicity). In attempts to meet the requirements of humanity's well-being, biomaterials scientists taking advantage of the structure and properties of nanocellulose aim to develop new and formerly non-existing materials with novel and multifunctional properties. This book highlights the importance of nanocellulose and reviews its synthesis, types, structure and properties. Further, it discusses various biofabrication approaches and applications of nanocellulose-based biomaterials in various fields such as the environment, biomedicine, optoelectronics, pharmaceuticals, paper, renewable energy and the food industry. Devised to have a broad appeal, this book will be useful to beginners, who will appreciate its comprehensive approach, as well as active researchers, who will find the focus on recent advancements highly valuable.

Provides a one-stop source for information on synthesis, properties, and potential applications of nanotube reinforced polymer nanocomposites Research on polymer nanotube composites is a relatively new field, and a lot of development is required to achieve a very large-scale commercial application. Although a number of developments have taken place in terms of the dispersion of nanotubes in the polymer matrices and corresponding improvements in the various physical properties of the composites, a meaningful text on the subject, which can assimilate these advancements in one place to provide an overall potential of the technology, is missing. This edited volume brings together contributions from a variety of senior scientists in the field of polymer nanotube composites technology to shed light on the recent advances in these commercially important areas of polymer technology. The book provides the following features: A summary of recent advances in nanotube composite synthesis technology A basic introduction to polymer nanotube nanocomposite technology for readers who are new to the field Valuable insights for the use of technologies for polymer nanocomposites for commercial application Reviews of current

polymer nanotube systems to underscore the high potential of nanotubes as fillers Pathways for large-scale commercial applications of nanotube nanocomposites

An overview of the current state of nanotechnology-based devices with applications in environmental science, focusing on nanomaterials and polymer nanocomposites. The handbook pays special attention to those nanotechnology-based approaches that promise easier, faster and cheaper processes in environmental monitoring and remediation. Furthermore, it presents up-to-date information on the economics, toxicity and regulations related to nanotechnology in detail. The book closes with a look at the role of nanotechnology for a green and sustainable future. With its coverage of existing and soon-to-be-realized devices this is an indispensable reference for both academic and corporate R&D.

This book presents selected papers from the 5th International Conference on Mechanical, Manufacturing and Plant Engineering (ICMMPE 2019), held in Kuala Lumpur, Malaysia. It highlights the latest advances in the area, brings together researchers and professionals in the field and provides a valuable platform for exchanging ideas and fostering collaboration. Joining technologies could be change to manufacturing technologies. Addressing real-world problems concerning joining technologies that are at the heart of various manufacturing sectors, the respective papers present the outcomes of the latest experimental and numerical work on problems in soldering, arc welding and solid-state joining technologies. technologies. technologies. technologies. technologies. technologies. technologies. technologies. technologies. technologies.

Metal Oxide Nanocomposites: Synthesis and Applications summarizes many of the recent research accomplishments in the area of metal oxide-based nanocomposites. This book focussing on the following topics: Nanocomposites preparation and characterization of metal oxide nanocomposites; synthesis of core/shell metal oxide nanocomposites; multilayer thin films; sequential assembly of nanocomposite materials; semiconducting polymer metal oxide nanocomposites; graphene-based metal and metal oxide nanocomposites; carbon nanotube–metal–oxide nanocomposites; silicon mixed oxide nanocomposites; gas semiconducting sensors based on metal oxide nanocomposites; metal]organic framework nanocomposite for hydrogen production and nanocomposites application towards photovoltaic and photocatalytic.

Papers from a December 2003 symposium review and discuss the science and technology of nanostructured materials and nanocomposites, with special emphasis placed on the relationships between their fabrication, structure, strength, and ductility. Major themes are nanoscience and nanoengineering of bulk and composite materials, thick coatings, and thin films with enhanced mechanical properties for structural and functional applications. The book will be of interest to researchers and graduate students in nanostructured materials science, and for engineers involved in the production and processing of nanocrystalline materials and nanocomposites for structural and functional applications. Annotation : 2004 Book News, Inc., Portland, OR (booknews.com).

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