

Composites With Micro And Nano Structure Computational Modeling And Experiments Computational Methods In Applied Sciences

This publication offers readers a novel book on ceramic and metal matrix composites, covering processing/fabrication/synthesis and properties within the framework of the functional and structural perspectives, focusing on the most recent developments and applications at the micro and nano scales. Some of the main features of the book include: - a predication of an integral perspective on the concept of composite materials, i.e., that the concept of composites refers not only to structural applications but also to functional applications -Versatility, in the sense that it is designed for graduate students, but it can also be used by beginners and experts (lecturers, researchers) in the field of composite materials -Introduction of a new set of concepts like functional phase, in situ composites, multifunctional composites, etc. -Inclusion of the environmental/sustainability current issues, from the processing and end-life perspectives. It is also intended to be as a source of reference for entrepreneurs who are planning to venture in the field of composites. Since nanotechnology is in continuous growth and offers an extremely broad range of potential topics and applications for composites, it will be idealistic and impractical to try to cover all of them. In this regard, it is proposed to plan on presenting revised and augmented versions in further book editions.

Tribology of Graphene: Simulation Methods, Preparation Methods, and Their Applications provides an exhaustive reference guide on the tribology of graphene-based materials. The book begins with a discussion on the selection of the proper graphene-based material and then segues into how to choose a deposition method, how to control of its structure and properties, and the most effective working conditions and applications. The latest developments in theoretical simulations of graphene friction, preparation methods, and effective applications are all reviewed, as are the ways various graphene coatings can be successfully employed to decrease friction and wear in nano-, micro- and macro-mechanical applications. Synthesizes the broad current research in tribological applications of graphene all in one place Covers theoretical simulations and preparation methods, including insights on how to put them into practice, allowing for quicker and more effective selection of graphene-based material Provides a broader perspective by discussing both graphene-based composites and additives

Polymer Composites with Functional Nanoparticles: Synthesis, Properties, and Applications reviews the latest research in the area of polymer nanocomposites and functionalized nanoparticles, providing an introduction for those new to the field, and supporting further research and development. The book helps researchers and practitioners better understand the key role of nanoparticle functionalization for improving the compatibility of inorganic metallic nanomaterials with organic polymers, and for the fabrication of nanostructured materials with special properties. A range of nanoparticles, such as carbon nanotubes are covered, along with descriptions of the methods of functionalization to support better compatibility with polymer matrices. The book also discusses the various applications of this technology, including uses in

electronics and the medical and energy industries. Summarizes the latest research in functionalized nanoparticles for modification of polymer matrices, providing a valuable platform for further research. Includes functionalization of a range of nanoparticles for incorporation into nanocomposites, including carbon nanotubes, graphene, gold and silver, silica and clay. Provides detailed coverage of application areas, including energy, electronics, biomedical applications, and end-of-life considerations.

Polymer and its composites have replaced a great number of metal products in industry and are still in a rapid growth in many areas due to their attractive properties such as low density, high specific strength and specific stiffness, corrosion resistance, and manufacturability. The properties of polymers have been considerably improved by the incorporation of fillers and fiber reinforcement. The mechanical and tribological studies on polyphenylene sulfide (PPS) and its composites have not been hitherto carried out extensively and are deserving of attention in view of their potential for being used in a wide variety of applications. PPS has a great potential in high speed sliding applications owing to its high temperature capability; however, its wide application as a promising matrix material in tribology is still at infancy and so there is a need of the comprehensive study of its mechanical and tribological behaviors. In this dissertation, the effect of fillers and fibers as reinforcements in PPS was performed with respect to the tribological and mechanical properties. A number of fillers based on the minerals abundantly available in Armenia were used in this study along with other inorganic compound fillers and short microfibers as reinforcement. The fillers used were both in micro and nano sizes. Finally, the effect of carbon nanotubes and carbon nanofibers as the reinforcements in PPS has also been studied in terms of their thermal, mechanical, and tribological properties.

The processing and mechanical behaviour of bulk nanostructured materials are one of the most interesting new fields of research on advanced materials systems. Many nanocrystalline materials possess very high strength with still good ductility, and exhibit high values of fatigue resistance and fracture toughness. There has been continuing interest in these nanomaterials for use in structural and biomedical applications, and this has led to a large number of research programs worldwide. This book focuses on the processing techniques, microstructures, mechanical and physical properties, and applications of bulk nanostructured materials, as well as related fundamental issues. Only since recently can such bulk nanostructured materials be produced in large bulk dimensions, which opens the door to their commercial applications.

Composite Nanoadsorbents discusses the most recent advances in the field, including promising techniques for waste water decontamination and the advantages and drawbacks of nanoadsorbents in these applications. The implications of nanoadsorbents to public health and future developments for facilitating environmental sustainability are also discussed. New approaches for nanomaterials are analyzed, focusing on the effect of nanotechnology in adsorption applications. The effectiveness of nanosized materials is evaluated, along with cost factors and new synthesis routes of composite nanomaterials. Combining the areas of nanotechnology, adsorption, and composite surface chemistry, the synthesis, modifications and applications of nanotechnology in the adsorption process are demonstrated. Edited by a prolific expert in the field, this book will be a valuable resource for researchers, postgraduate students and professionals in the fields of nanotechnology, adsorption and materials synthesis.

Bridges the gap between theory and application of composite nanoadsorbents Provides an understanding of the benefits of nanoadsorbents and their cost, efficiency and novelty Includes material on inorganic nanoadsorbents and carbon nanotubes 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.

The Handbook of Composites From Renewable Materials comprises a set of 8 individual volumes that brings an interdisciplinary perspective to accomplish a more detailed understanding of the interplay between the synthesis, structure, characterization, processing, applications and performance of these advanced materials. The handbook covers a multitude of natural polymers/ reinforcement/ fillers and biodegradable materials. Together, the 8 volumes total at least 5000 pages and offers a unique publication. This 2nd volume of the Handbook is solely focused on the Design and Manufacturing of renewable materials. Some of the important topics include but not limited to: design and manufacturing of high performance green composites; manufacturing of high performance biomass-based polyesters by rheological approach; components design of fibrous composite materials; design and manufacturing of bio-based sandwich structures; design and manufacture of biodegradable products from renewable resources; manufacturing and characterization of quicklime filled metal alloy composites for single row deep groove ball bearing; manufacturing of composites from chicken feathers and poly (vinyl chloride); production of porous carbons from resorcinol-formaldehyde gels: applications; composites using agricultural wastes; manufacturing of rice wastes-based natural fiber polymer composites from thermosetting vs. thermoplastic matrices; thermoplastic polymeric composites; natural fiber reinforced PLA composites; rigid closed-cell PUR foams containing polyols derived from renewable resources; preparation and application of the composite from alginate; recent developments in biocomposites of bombyx mori silk fibroin; design and manufacturing of natural fiber/ synthetic fiber reinforced polymer hybrid composites; natural fibre composite strengthening solution for structural beam component for enhanced flexural strength; high pressure resin transfer molding of epoxy resins from renewable sources; cork based structural composites; the use of wheat straw as an agricultural waste in composites for semi-structural applications and design/ manufacturing of sustainable composites.

This book presents new results in the knowledge and simulations for composite nano-

materials. It includes selected, extended papers presented in the thematic ECCOMAS conference on Composites with Micro- and Nano-Structure (CMNS) – Computational Modelling and Experiments. It contains atomistic and continuum numerical methods and experimental validation for composite materials reinforced with particles or fibres, porous materials, homogenization and other important topics.

Sustainable Biopolymer Composites: Biocompatibility, Self-healing, Modeling, Repair and Recyclability focuses on sustainable polymer composites also referred to as bio-composites. Vital aspects such as biodegradability, biocompatibility, repair and recyclability are discussed in detail. In addition, complexities like rapid and scalable processing, onsite repair, and minimal environmental effects are also covered along with the appropriateness of advanced polymer composites for structural applications in automotive, aviation and marine industries. This book will be an indispensable resource for scientists, engineers, physicists and chemists who are interested in the preparation, applications and repair analysis of bio-based composites and nano-composites for different types of applications. The composites repair process is extremely complex, hence it is essential to have a comprehensive understanding of damage mechanisms to apply the most suitable repair technique. Damage assessment using onsite inspection, e.g., NDT, THz techniques and the automated repair process for reliability and repeatability, are vital parameters when executing bonded composite repair.

Furthermore, overall integrity and structural health monitoring of composites repair is also necessary. Features detailed information on damage detection, failure analysis and repair of advanced bio-polymer composites Emphasizes biocompatibility, degradation and recyclability of these materials Features key chapters on molecular dynamics, multi-scale modeling and self-healing Presents a roadmap for materials selection, processing and industrial utilization for a broad range of applications This book presents an extensive review of literature on the properties of carbon nanofibers (CNF) reinforced polymer composites in conjunction with advances in the production and properties of CNFs. It further provides readers a view into the development of lightweight composites whose properties are tailored and enhanced with micro- and nano-reinforcement, along with results from data comparisons from several published investigations.

Micro and Nano Fibrillar Composites (MFCs and NFCs) from Polymer Blends Woodhead Publishing

This book comprehensively addresses surface modification of natural fibers to make them more effective, cost-efficient, and environmentally friendly. Topics include the elucidation of important aspects surrounding chemical and green approaches for the surface modification of natural fibers, the use of recycled waste, properties of biodegradable polyesters, methods such as electrospinning, and applications of hybrid composite materials.

The use of polymer composites in various engineering applications has become state of the art. This multi-author volume provides a useful summary of updated knowledge on polymer composites in general, practically integrating experimental studies, theoretical analyses and computational modeling at different scales, i. e. , from nano- to macroscale. Detailed consideration is given to four major areas: structure and properties of polymer nanocomposites, characterization and modeling, processing and application of macrocomposites, and mechanical performance of macrocomposites.

The idea to organize this volume arose from a very impressive workshop - The First International Workshop on Polymers and Composites at IVW Kaiserslautern: Invited Humboldt-Fellows and Distinguished Scientists, which was held on May 22-24, 2003 at the University of Kaiserslautern, Germany. The contributing authors were invited to incorporate updated knowledge and developments into their individual chapters within a year after the workshop, which finally led to these excellent contributions. The success of this workshop was mainly sponsored by the German Alexander von Humboldt Foundation through a Sofia Kovalevskaja Award Program, financed by the Federal Ministry for Education and Research within the "Investment in the Future Program" of the German Government. In 2001, the Humboldt Foundation launched this new award program in order to offer outstanding young researchers throughout the world an opportunity to establish their own work-groups and to develop innovative research concepts virtually in Germany. One of the editors, Z.

Biological materials and their applications have drawn increasing attention among scientists. Cellulose is an abundant, renewable, biodegradable, economical, thermally stable, and light material, and it has found application in pharmaceuticals, coatings, food, textiles, laminates, sensors, actuators, flexible electronics, and flexible displays. Its nano form has extraordinary surface properties, such as higher surface area than cellulose; hence, nanocellulose can be used as a substitute for cellulose. Among many other sustainable, functional nanomaterials, nanocellulose is attracting growing interest in environmental remediation technologies because of its many unique properties and functionalities. *Nanocellulose and Its Composites for Water Treatment Applications* supplies insight into the application of nanocellulose and its nanocomposites for water purification and remediation. It covers different classes of nanocellulose—cellulose nanocrystal (CNC), microfibrillated cellulose (MFC), hairy cellulose nanocrystalloid (HCNC), and bacterial nanocellulose (BNC)—for their competency with other renewable and carbonaceous materials such as pectin, alginate, and CNTs. Future perspectives of nanocellulose and nanocomposites gleaned from different biodegradable origins are also discussed. This book delves into an updated description of the basic principles and developments in synthesis, characterization methods, properties (chemical, thermal, optical, structural, surface, and mechanical structure), property relationships, crystallization behavior, and degradability of biodegradable nanocomposites. The book also supplies vivid information about various cellulose nanomaterials and their applications in absorbing organic and inorganic toxins, membrane filtration of bacteria, viruses, and ionic impurities, photocatalytic dye removal, and sensing of water toxins. Features Details the synthesis and characterization methods of nanocellulose Illustrates the applications of nanocellulose and its nanocomposites Shows in-depth accounts of the various types of properties of nanocellulose and its composites Features emerging trends in the use of nanocellulose as adsorbents, sensors, membranes, and photocatalysis materials This book will be useful for academics, researchers, and engineers working in water treatment and purification.

In the field of tribology, the wear behaviour of polymers and composite materials is considered a highly non-linear phenomenon. *Wear of Polymers and Composites* introduces fundamentals of polymers and composites tribology. The book suggests a new approach to explore the effect of applied load and surface defects on the fatigue wear behaviour of polymers, using a new tribometer and thorough experiments. It

discusses effects of surface cracks, under different static and cyclic loading parameters on wear, and presents an intelligent algorithm, in the form of a neural network, to map the relationship between wear rate and relevant factors. Using the aforementioned method leads to more accurate and cost effective prediction of surface fatigue wear rates, under different service conditions. The first three chapters of the book introduce polymers and composite materials tribology, followed by three chapters that cover testing in wear, applied load and contact pressure and surface defects. The remaining chapter moves on to predicting wear of polymers, and concludes by discussing questions and problems. Prepares senior undergraduates as well as postgraduate students Focuses on the factors influencing wear of polymers and composites Contains detailed design of Tribometer, wear test procedures and detailed dataset of more than 50 experimental wear tests Introduces an artificial neural network approach as one of the recently developed wear prediction models.

Finally, the laminae widths in the composite are reduced to the sub-100nanometer range. A novel process flow for the fabrication of composite structures with these size scales is developed, which has applications for size reductions of microscale devices in general. Fracture tests performed on these "nano-composites" shows their effectiveness in preventing failure due to pre-existing flaws in structures.

In recent years an increasing interest has been devoted to nanostructured composites. This attention is largely due to exciting possible applications ranging from new catalysts to the preparation of nanocomposites ceramics, with significant improvements in their properties. This book provides a comprehensive survey of French contributions t Nanostructured Polymer Composites for Biomedical Applications addresses the challenges researchers face regarding the creation of nanostructured polymer composites that not only have superior performance and mechanical properties, but also have acceptable biological function. This book discusses current efforts to meet this challenge by discussing the multidisciplinary nature of nanostructured polymer composite biomaterials from various fields, including materials science, polymer science, biomedical engineering and biomedicine. This compilation of existing knowledge will lead to the generation of new terminology and definitions across individual disciplines. As such, this book will help researchers and engineers develop new products and devices for use in effective medical treatment. Summarizes the most recent strategies to develop nanostructured polymer composite biomaterials for biomedicine Outlines the major preparation and characterization techniques for a range of polymer nanocomposites used in biomedicine Explores the design of new types of nanostructured polymer composites for applications in drug delivery, tissue engineering, gene therapy and bone replacement

There is a major lack of fundamental knowledge and understanding on the interaction between a filler and the polymer matrix. When it comes to nanoscale fillers, such as layered silicates, carbon nanotubes, graphene or cellulose nanofibers it is even more important to know accurate structure-property relationships as well as identifying the parameters influencing material behavior. The reason for the lack of knowledge on how to process nanocomposites and why there are so few applications is that several scientific fields are affected and a joint effort of those scientific communities involved is necessary – starting from the filler manufacturing or pre-processing over polymer chemistry to the polymer processing. In Polymer Nanoclay Composites, all involved

scientific areas are viewed together for the first time, providing an all-embracing coverage of all stages of polymer clay nanocomposites processing from lab-scale to industrial scale – stages from the raw material over manufacturing of polymer clay nanocomposites to characterization and the final products. Readers will gain insight in the physical/chemical pre-processing of layered silicates and their incorporation into a polymer matrix using sophisticated technologies (such as advanced compounding) as well as in real-time quality control of the nanocomposite production and future prospects. The book also describes nanotoxicological and nanosafety aspects. Covers the whole processing route with all aspects of the nanocomposites industry with particular focus on the processing of polymer clay nanocomposites Includes quality control and nanosafety Multidisciplinary approach from an industrial perspective This volume of the journal "Nano Hybrids and Composites" offers our readers a collection of the peer-reviewed articles covering some practical aspects in the research of properties and application of the micro- and nano-hybrid composite materials, ferronematic nanoparticles and multi-walled carbon nanotubes in the optoelectronics and sensors, research of the hybrid metal matrix composites and reinforced composites, fused borosilicate syntactic foam and innovative mixed concrete for the road pavement. We hope that the presented volume will be useful for many specialists from the area of modern functional materials.

Advancements in polymer nanocomposite foams have led to their application in a variety of fields, such as automotive, packaging, and insulation. Employing nanocomposites in foam formation enhances their property profiles, enabling a broader range of uses, from conventional to advanced applications. Since many factors affect the generation of nanost

The scientific literature with respect to liquid silicone rubbers is collected in this monograph. The text focuses on the fundamental issues such as properties, curing methods, special materials, as well as the latest development and provides a broad overview of the materials used therein. In particular, materials and compositions for liquid functional rubbers are discussed. Also, methods of curing and special properties are described, such as tracking and erosion resistance, adhesion properties, storage and thermal stability. Methods of curing are precision casting, hybrid additive manufacturing, peroxide curing, ultraviolet curing, liquid injection molding, or hot embossing. The book includes applications including automotive and underwater applications, electrical and optical uses, as well as medical uses.

Recent Developments in Polymer Macro, Micro and Nano Blends: Preparation and Characterisation discusses the various types of techniques that are currently used for the characterization of polymer-based macro, micro, and nano blends. It summarizes recent technical research accomplishments, emphasizing a broad range of characterization methods. In addition, the book discusses preparation methods and applications for various types of polymer-based macro, micro, and nano blends. Chapters include thermoplastic-based polymer & nano blends, applications of rubber based and thermoplastic blends, micro/nanostructures polymer blends containing block copolymers, advances in polymer-inorganic hybrids as membrane materials, synthesis of polymer/inorganic hybrids through heterophase polymerizations, nanoporous polymer foams from nanostructured polymer blends, and natural polymeric biodegradable nano blends for protein delivery. Describes the techniques pertaining to

a kind (or small number) of blends, showing specific examples of their applications
Covers micro, macro, and nano polymer blends
Contains contributions from leading experts in the field

Heterogeneous Micro and Nanoscale Composites for the Catalysis of Organic Reactions discusses the major properties and applications of heterogeneous micro and nanoscale composites, including surface coating and functionalization capability, effective physical properties, recovery and reusability, biocompatibility and biodegradability. In addition, preparation strategies and essential analytical methods for the characterization of these materials are investigated. The effects of morphology, porosity and sizes of these composites on catalytic activity are also discussed. This book is an important reference source for materials engineers and chemical engineers who are interested in heterogeneous, thin-scaled materials and catalyzed organic synthesis reactions. In addition, this book will help researchers design novel structures and apply them in catalytic applications. Provides information on the preparation, characterization and applications of catalysis of organic reactions
Outlines the major catalytic applications of heterogenous nanocomposites
Assesses the major challenges of manufacturing heterogenous nanocomposites on an industrial scale

The aim of this book is to give a state-of-art overview on aspects of micro- and nanomechanics of polymers, polymeric blends and composites. Major issues tackled are the followings: experimental techniques to study the mechanical performance of polymer systems especially in respect with molecular, supermolecular and filler architectures on suitable model materials; prediction methods of the mechanical performance (short and long term properties); modeling tools and approaches. All these aspects will be highlighted on polymeric systems of both academic and practical relevance. The outcome should be a reference book keeping its actuality for, at least, the next decade.

Nanocellulose Based Composites for Electronics presents recent developments in the synthesis and applications of nanocellulose composites in electronics, highlighting applications in various technologies. Chapters covers new trends and challenges in a wide range of electronic applications and devices. Significant properties, safety, sustainability, and environmental impacts of the electronic devices are included, along with the challenges of using nanocellulose-based composites in electronics. This book is an important reference for materials scientists and engineers configuring and designing processes for the synthesis and device fabrication of nanocellulose composites in electronics. Explores how to utilize nanocellulose fibers and nanocrystalline cellulose substances to synthesize materials with designed functionalities
Outlines the major production processes for nanocellulose composites
Discusses the major challenges that need to be surmounted in order to effectively use nanocellulose composites for electronics

Micro- and Nanostructured Composite Materials for Neutron Shielding Applications presents recent developments and future possibilities for neutron shielding materials. Emphasis is placed on the correlation between the morphology, shielding mechanisms, and other desired properties, including their mechanical and thermal properties. The effect of neutron absorbing fillers, including their size on final properties is also examined, as are recent advancements in preparation, characterization and simulation techniques. Written by specialists in their respective fields, this comprehensive

resource will help professionals and students understand the fundamentals of neutron shielding, as well as the properties of micro- and nanopolymer-based composites, concrete materials, alloy materials and metal-ceramic composites. Provides an up-to-date understanding of the fundamentals of shielding mechanisms, morphology and material property correlations Covers a broad range of micro and nano composite materials for neutron shielding Discusses recent advances surrounding the synthesis and processing of nanostructures and nanocomposite materials

3D and 4D Printing of Polymer Nanocomposite Materials: Processing, Applications, and Challenges covers advanced 3D and 4D printing processes and the latest developments in novel polymer-based printing materials, thus enabling the reader to understand and benefit from the advantages of this groundbreaking technology. The book presents processes, materials selection, and printability issues, along with sections on the preparation of polymer composite materials for 3D and 4D printing. Across the book, advanced printing techniques are covered and discussed thoroughly, including fused deposition modeling (FDM), selective laser sintering (SLS), selective laser melting (SLM), electron beam melting (EBM), inkjet 3D printing (3DP), stereolithography (SLA), and 3D plotting. Finally, major applications areas are discussed, including electronic, aerospace, construction and biomedical applications, with detailed information on the design, fabrication and processing methods required in each case. Provides a thorough, clear understanding of polymer preparation techniques and 3D and 4D printing processes, with a view to specific applications Examines synthesis, formation methodology, the dispersion of fillers, characterization, properties, and performance of polymer nanocomposites Explores the possibilities of 4D printing, covering the usage of stimuli responsive hydrogels and shape memory polymers

Discover a one-stop resource for in-depth knowledge on epoxy composites from leading voices in the field Used in a wide variety of materials engineering applications, epoxy composites are highly relevant to the work of engineers and scientists in many fields. Recent developments have allowed for significant advancements in their preparation, processing and characterization that are highly relevant to the aerospace and automobile industry, among others. In Epoxy Composites: Fabrication, Characterization and Applications, a distinguished team of authors and editors deliver a comprehensive and straightforward summary of the most recent developments in the area of epoxy composites. The book emphasizes their preparation, characterization and applications, providing a complete understanding of the correlation of rheology, cure reaction, morphology, and thermo-mechanical properties with filler dispersion. Readers will learn about a variety of topics on the cutting-edge of epoxy composite fabrication and characterization, including smart epoxy composites, theoretical modeling, recycling and environmental issues, safety issues, and future prospects for these highly practical materials. Readers will also benefit from the inclusion of: A thorough introduction to epoxy composites, their

synthesis and manufacturing, and micro- and nano-scale structure formation in epoxy and clay nanocomposites An exploration of long fiber reinforced epoxy composites and eco-friendly epoxy-based composites Practical discussions of the processing of epoxy composites based on carbon nanomaterials and the thermal stability and flame retardancy of epoxy composites An analysis of the spectroscopy and X-ray scattering studies of epoxy composites Perfect for materials scientists, polymer chemists, and mechanical engineers, *Epoxy Composites: Fabrication, Characterization and Applications* will also earn a place in the libraries of engineering scientists working in industry and process engineers seeking a comprehensive and exhaustive resource on epoxy composites.

The 21st volume of the journal "Nano Hybrids and Composites" offers readers a collection of the peer-reviewed articles covering some practical aspects in the researching of properties and application of the micro- and nano-hybrid composite materials, quantum dots in the optoelectronics and the research of the application of a silica modified membrane for the gas separation processes. Because we are living in an era of Green Science and Technology, developments in the field of bio- and nano- polymer composite materials for advanced structural and medical applications is a rapidly emerging area and the subject of scientific attention. In light of the continuously deteriorating environmental conditions, researchers all over the world have focused an enormous amount of scientific research towards bio-based materials because of their cost effectiveness, eco-friendliness and renewability. This handbook deals with cellulose fibers and nano-fibers and covers the latest advances in bio- and nano- polymer composite materials. This rapidly expanding field is generating many exciting new materials with novel properties and promises to yield advanced applications in diverse fields. This book reviews vital issues and topics and will be of interest to academicians, research scholars, polymer engineers and researchers in industries working in the subject area. It will also be a valuable resource for undergraduate and postgraduate students at institutes of plastic engineering and other technical institutes.

The New Frontiers of Organic and Composite Nanotechnology is an attempt to illustrate current status of modern nanotechnology. The book is divided into 3 main sections, introduction and conclusion. The introduction describes general questions of the problem and main lines of the research activities. In the first section methods of the nanostructures construction are described. Second section is dedicated to the Structure-property relationship. Special attention is paid to the description of the most powerful experimental methods and tools used in nanotechnology, such as probe microscopies, spectroscopies, and scattering methods, including the utilization of synchrotron radiation facilities. The third section describes the applications of nanotechnology in electronics, biotechnology and diagnostics. Conclusion part presents a summary of the status of works in this area and gives some perspectives of the further development.

Reference to practically all original works with essential results, that resulted in the development of nanotechnology Coherent group of well-known authors in the field of nanotechnology Book spans topics applicable for both the didactic and research

Micro and Nano Fibrillar Composites (MFCs and NFCs) from Polymer Blends is a comprehensive reference for researchers, students and scientists working in the field of plastics recycling and composites. The book aims to determine the influence of micro and nanofibrillar morphology on the properties of immiscible blend systems. Chapters cover micro and nanofibrillar composites based on polyolefin, liquid crystal polymer, biodegradable polymers, polyester and polyamide blends in various industrial application fields. The book brings together panels of highly-accomplished experts in the field of plastics recycling, blends and composites systems. For several decades, plastic technology has played an important role in many industrial applications, such as packaging, automobiles, aerospace and construction. However the increasing use of plastics creates a lot of waste. This has led to restrictions on the use of some plastics for certain applications and a drive towards recycling of plastics. More recently, microfibrillar in-situ composites have been prepared from waste plastics such as PET/PP, PET/PE and Nylon/PP as a way of formulating new high performance polymer systems. This book tackles these issues and more, and is an ideal resource for anyone interested in polymer blends. Provides information on MFC and NFC based polymer blends that have been accumulated over the last 25 years, providing a useful reference Adopts a novel approach in terms of understanding the relationship between processing, morphology, structure, properties and applications in micro and nanofibrillar composites Contains contributions from leading experts in the field from both industrial and academic research

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