# Morphological Electrical And Mechanical Characterization

Fundamentals and Recent Advances in Nanocomposites Based on Polymers and Nanocellulose brings together the latest research in cellulose-based nanocomposites, covering fundamentals, processing, properties, performance, applications, and the state of the art. The book begins by explaining the fundamentals of cellulose and cellulose-based nanocomposites, including sources, extraction, types, classification, linkages, model structure, model compounds, and characterization techniques. The second part of the book covers the incorporation of cellulose fillers to improve the properties or characteristics of nanocomposites, organized by composite category, including in aerogels, thermoplastic composites, thermoset composites, bioplastic composites, carbon nanofibers, rubber composites, carbon fibers, and foaming materials. Throughout these chapters, there is an emphasis on the latest innovations and application potential. Finally, applications are explored in more detail, notably focusing on the utilization of nanocellulose in biodegradable composites for biomedical applications, along with other important industrial application areas. This book is of great interest to researchers, scientists, and advanced students working with bio-based materials, and across polymer science, nanomaterials, composite materials, plastics engineering, chemical engineering, materials science and engineering, as well as R&D professionals, engineers, and industrialists interested in the development of bio-based materials for advanced applications or material commercialization. Presents the fundamentals of cellulose-based nanocomposites, including sources, extraction, types, classification, linkages, structure, compounds, and characterization. Discusses and analyzes the most suitable fabrication methods and processing techniques for cellulose as a reinforcement in a range of composites. Opens the door to a range of cutting-edge applications and considers key aspects such as cost, lifecycle, and biodegradability.

Advances in Carbon Research and Application: 2013 Edition is a ScholarlyEditions™ book that delivers timely, authoritative, and comprehensive information about Fullerenes. The editors have built Advances in Carbon Research and Application: 2013 Edition on the vast information databases of ScholarlyNews.™ You can expect the information about Fullerenes in this book to be deeper than what you can access anywhere else, as well as consistently reliable, authoritative, informed, and relevant. The content of Advances in Carbon Research and Application: 2013 Edition has been produced by the world's leading scientists, engineers, analysts, research institutions, and companies. All of the content is from peer-reviewed sources, and all of it is written, assembled, and edited by the editors at ScholarlyEditions™ and available exclusively from us. You now have a source you can cite with authority, confidence, and credibility. More information is available at http://www.ScholarlyEditions.com/.

This study investigated the sintering behavior of silver nanopastes at 150°C,

180°C, and 210°C. The synthesized silver nanoparticles were dispersed to form ink pastes with 70 wt. % and 80 wt. % silver. The morphology of the sintered silver nanopastes was studied via transmission electron microscopy (TEM), scanning electron microscopy, and x-ray diffraction analyses. Electrical characterization, thermal/humidity aging, and mechanical testing were also performed. Silver nanoparticles were prepared via a chemical reduction method. TEM images revealed particle sizes ranging from 10 nm to 20 nm. Results showed that electrical conductivity could be achieved at 150°C. When the sintered silver nanoparticles were subjected to 1000 h of 85°C/85 % relative humidity testing, a stable resistivity was achieved at a sintering temperature no lower than 210°C. These results showed that a stable network of sintered silver nanoparticles with good mechanical properties could be achieved at 210°C. Nanotube Superfiber Materials refers to different forms of macroscale materials with unique properties constructed from carbon nanotubes. These materials include nanotube arrays, ribbons, scrolls, yarn, braid, and sheets. Nanotube materials are in the early stage of development and this is the first dedicated book on the subject. Transitioning from molecules to materials is a breakthrough that will positively impact almost all industries and areas of society. Key properties of superfiber materials are high flexibility and fatigue resistance, high energy absorption, high strength, good electrical conductivity, high maximum current density, reduced skin and proximity effects, high thermal conductivity, lightweight, good field emission, piezoresistive, magnetoresistive, thermoelectric, and other properties. These properties will open up the door to dozens of applications including replacing copper wire for power conduction, EMI shielding, coax cable, carbon biofiber, bullet-proof vests, impact resistant glass, wearable antennas, biomedical microdevices, biosensors, self-sensing composites, supercapacitors, superinductors, hybrid superconductor, reinforced elastomers, nerve scaffolding, energy storage, and many others. The scope of the book covers three main areas: Part I: Processing; Part II: Properties; and Part III: Applications. Processing involves nanotube synthesis and macro scale material formation methods. Properties covers the mechanical, electrical, chemical and other properties of nanotubes and macroscale materials. Different approaches to growing high quality long nanotubes and spinning the nanotubes into yarn are explained in detail. The best ideas are collected from all around the world including commercial approaches. Applications of nanotube superfiber cover a huge field and provides a broad survey of uses. The book gives a broad overview starting from bioelectronics to carbon industrial machines. First book to explore the production and applications of macro-scale materials made from nano-scale particles. Sets out the processes for producing macro-scale materials from carbon nanotubes, and describes the unique properties of these materials Potential applications for CNT fiber/yarn include replacing copper wire for power conduction, EMI shielding, coax cable, carbon biofiber, bullet-proof vests, impact resistant glass, wearable antennas, biomedical microdevices, biosensors, self-

sensing composites, supercapacitors, superinductors, hybrid superconductor, reinforced elastomers, nerve scaffolding, energy storage, and many others. Presenting the latest coverage of the fundamentals and applications of nanofibrous materials and their structures for graduate students and researchers, this book bridges the communication gap between fiber technologists and materials scientists and engineers. Featuring intensive coverage of electroactive, bioactive and structural nanofibers, it provides a comprehensive collection of processing conditions for electrospinning and includes recent advances in nanoparticle-/nanotube-based nanofibers. The book also covers mechanical properties of fibers and fibrous assemblies, as well as characterization methods.
This volume includes select papers presented during the 4th International and 19th National Conference on Machines and Mechanism (iNaCoMM 2019), held in Indian Institute of Technology, Mandi. It presents research on various aspects of design and analysis of machines and mechanisms by academic and industry researchers.
Individual carbon nanotubes (CNTs) have exceptional mechanical and electrical properties. However, the transfer of these extraordinary qualities into CNT products, without compromising performance, remains a challenge. This chapter presents an overview of the manufacturing of CNT sheets and buckypaper and also describes research performed at the University of Cincinnati in this field. CNT arrays were grown using the chemical vapor deposition method. Sheets were drawn from the spinnable CNT arrays and characterized using scanning electron microscopy to show the highly unidirectional alignment of the nanotubes in the sheet. The anisotropic morphology of the sheet provides superior properties along one material axis as observed by measuring the tensile strength, electrical resistivity, optical transmittance, and electromagnetic interference shielding properties of the material. Surface modification of aligned multiwall nanotube sheets was carried out via incorporation of an atmospheric pressure plasma jet in the sheet posttreatment process. Helium/oxygen plasma was utilized to produce carboxyl (–COO?) functionality on the surface of the nanotubes. X-ray photoelectron spectroscopy confirmed the presence of the functional groups on the nanotube surface. The sheet was further characterized using Raman spectroscopy, Fourier transform infrared spectroscopy, and contact angle testing. Composite laminates made from functionalized CNT sheets showed higher strength than those made with pristine sheets. The effects of plasma power and oxygen concentration were studied in order to determine the best possible parameters for functionalization. Plasma treatment is a useful tool for fast, clean and dry functionalization of CNTs. This study demonstrates the ease of incorporating the plasma tool in the manufacturing process of sheets leading to the production of CNT/polymer composites. Macroscopic structures of nanotubes such as threads and sheets are leading to novel applications. Conductive ink is a special type of ink that allows an electric current to flow through the ink. The conductive ink-filled epoxy is also known as conductive

composite because the ink itself is based on more than two ingredients such as filler, binder and hardener. As interconnect material, the conductive inks should feature good electrical, mechanical and thermal properties. Nonetheless, to-date, there are some issues with current conductive ink that available in the market namely printing quality, high electrical resistivity as well as inferior mechanical strength. Therefore, this book aims to produce highly functional conductive ink using two types of carbon-based conductive fillers with epoxy as a binder. More specifically, graphene nanoplatelets (GNP) and multiwalled carbon nanotube (MWCNT) were used to produce the hybrid conductive ink. It is very important to make sure the materials are contact with each other and therefore the movement of an electron will become easier.

Understanding the properties of polymer carbon nanotube (CNT) composites is the key to these materials finding new applications in a wide range of industries, including but not limited to electronics, aerospace and biomedical/bioengineering. Polymer-carbon nanotube composites provides comprehensive and in-depth coverage of the preparation, characterisation, properties and applications of these technologically interesting new materials. Part one covers the preparation and processing of composites of thermoplastics with CNTs, with chapters covering in-situ polymerization, melt processing and CNT surface treatment, as well as elastomer and thermoset CNT composites. Part two concentrates on properties and characterization, including chapters on the quantification of CNT dispersion using microscopy techniques, and on topics as diverse as thermal degradation of polymer/CNT composites, the use of rheology, Raman spectroscopy and multi-scale modelling to study polymer/CNT composites, and CNT toxicity. In part three, the applications of polymer/CNT composites are reviewed, with chapters on specific applications such as in fibres and cables, bioengineering applications and conductive polymer CNT composites for sensing. With its distinguished editors and international team of contributors, Polymer-carbon nanotube composites is an essential reference for scientists, engineers and designers in high-tech industry and academia with an interest in polymer nanotechnology and nanocomposites. Provides comprehensive and in-depth coverage of the preparation, characterisation and properties of these technologically interesting new materials Reviews the preparation and processing of composites of thermoplastics with CNTs, covering in-situ polymerization, melt processing and CNT surface treatment Explores applications of polymer/CNT composites such as in fibres and cables, bioengineering applications and conductive polymer CNT composites for sensing

This book details all current techniques for converting bulk polymers into nano-size materials. The authors highlight various physical and chemical approaches for preparation of nano-size polymers. They describe the properties of these materials and their extensive potential commercial applications.

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This is a timely, an informative, an interesting, and a well-managed book. The book not only offers an in-depth review of the current status of the knowledge of electrospinning and its biomedical applications but also discusses the emerging ideas and features, both from the East and West, with a focus on the needless electrospinning for the production of uniform fibers. The book is equally helpful to the experts of this field, who wish to enhance their understanding of the emerging technologies, and to the new comers, who can use this book as a reference.

Nanotechnology and regenerative engineering have emerged to the forefront as the most versatile and innovative technologies to foster novel therapeutic techniques and strategies of the twenty-first century. The first edition of Nanotechnology and Tissue Engineering: The Scaffold was the first comprehensive source to explain the developments in nanostructured biomaterials for tissue engineering, the relevance of nanostructured materials in tissue regeneration, and the current applications of nanostructured scaffolds for engineering various tissues. This fully revised second edition, renamed Nanotechnology and Regenerative Engineering: The Scaffold, provides a thorough update to the existing material, bringing together these two unique areas to give a perspective of the emerging therapeutic strategies for a wide audience. New coverage includes: Updated discussion of the importance of scaffolds in tissue engineering Exploration of cellular interactions at the nanoscale Complete range of fabrication processes capable of developing nanostructured scaffolds for regenerative engineering Applications of nanostructured scaffolds for neural, skin, cardiovascular, and musculoskeletal regenerative engineering FDA approval process of nanostructure scaffolds Products based on nanostructured scaffolds Due to the unique and tissue-mimic properties of the nanostructured scaffolds, the past five years have seen a tremendous growth in nanostructured materials for biological applications. The revised work presents the current state-of-the-art developments in nanostructured scaffolds for regenerative engineering.

Biorenewable polymers based nanomaterials are rapidly emerging as one of the most fascinating materials for multifunctional applications. Among biorenewable polymers, cellulose based nanomaterials are of great importance due to their inherent advantages such as environmental friendliness, biodegradability, biocompatibility, easy processing and cost effectiveness, to name a few. They may be produced from biological systems such as plants or be chemically synthesised from biological materials. This book summarizes the recent remarkable achievements witnessed in green technology of cellulose based nanomaterials in different fields ranging from biomedical to automotive. This book also discusses the extensive research developments for next generation nanocellulose-based polymer nanocomposites. The book contains seventeen chapters and each chapter addresses some specific issues related to nanocellulose and also demonstrates the real potentialities of these nanomaterials in different domains. The

key features of the book are: Synthesis and chemistry of nanocellulose from different biorenewable resources Different characterization of nanocellulosic materials and their respective polymer nanocomposites Physico-chemical, thermal and mechanical investigation of nanocellulose based polymer nanocomposites Provides elementary information and rich understanding of the present state-of- art of nanocellulose-based materials Explores the full range of applications of different nanocellulose-based 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

How Can Polymers Constructed From Living Organisms Help Eliminate the Disposal Issue? A unique category of materials called biodegradable polymers could help remedy a growing environmental concern. Biodegradable Polymeric Nanocomposites: Advances in Biomedical Applications considers the potential of biodegradable polymers for use in biomedical applications that include drug delivery, biosensors, and tissue engineering. Since biomaterials perform on a time-limited function and are designed to disappear from the body after use, the development of biopolymers could greatly reduce and eliminate the need for plastic products, most specifically those used in biomedical applications. Highlights Biomaterials and the Design and Application of Biomaterials Utilizing expert research contributors from around the world, this book considers the benefits and limitations of a variety of biomaterials, such as biopolymers, ceramics, biodegradable nanocomposites, and natural products–based biomaterials. It explores the bio-nano-interface; the interaction between nanoparticles and biomaterials, explains the basic concepts and methods of biodegradable nanocomposites (BNCs), and highlights recent developments in polymer-based bionanocomposites. The book provides an overview of degradation properties and the mechanical properties of biodegradable polymers. It also breaks down the mechanical properties and biocompatibility of starch-based polymers, and outlines distinct advantages (biodegradability and nontoxicity) that make them suitable as medical polymer materials. In addition, it highlights the FDA-approved biodegradable polyester family and focuses on the state-of-the-art recent advancements in drug-delivery devices. Biodegradable Polymeric Nanocomposites: Advances in Biomedical Applications

provides current knowledge on biopolymers, examines recent developments and trends, and considers future applications of polymers. Featuring the work of highly-qualified international researchers, this book addresses applications relevant to polymer and material science, as well as material, biomedical, and chemical engineering, and is of specific interest to polymer science engineers.

This volume gathers the proceedings of the 3rd International RILEM Workshop on Concrete Durability and Service Life Planning (ConcreteLife'20), held in Haifa, Israel in January 2020. The papers cover a range of topics in concrete curing, cracking in concrete structures, corrosion of steel in concrete, thermal and hygral effects, concrete in cold climates and under high temperatures, recycling, alkali-silica reactions, chloride and sulfate attacks, marine structures, transport phenomena, durability design, microstructure of concrete and volume changes, and life cycle assessment. The book also explores future trends in research, development, and practical engineering applications related to durable concrete construction, and focuses on the design and construction of concrete structures exposed to various environmental conditions and mechanical loading. Given its scope, it offers a valuable asset for all researchers and graduate students in the areas of cement chemistry, cement production, and concrete design.

This book discusses the methods synthesizing various carbon materials, like graphite, carbon blacks, carbon fibers, carbon nanotubes, and graphene. It also details different functionalization and modification processes used to improve the properties of these materials and composites. From a geometrical–structural point of view, it examines different properties of the composites, such as mechanical, electrical, dielectric, thermal, rheological, morphological, spectroscopic, electronic, optical, and toxic, and describes the effects of carbon types and their geometrical structure on the properties and applications of composites.

Biomechanics covers a wide field such as organ mechanics, tissue mechanics, cell mechanics to molecular mechanics. At the 6th World Congress of Biomechanics WCB 2010 in Singapore, authors presented the largest experimental studies, technologies and equipment. Special emphasis was placed on state-of-the-art technology and medical applications. This volume presents the Proceedings of the 6th WCB 2010 which was hold in conjunction with 14th International Conference on Biomedical Engineering (ICBME) & 5th Asia Pacific Conference on Biomechanics (APBiomech). The peer reviewed scientific papers are arranged in the six themes Organ Mechanics, Tissue Mechanics, Cell Mechanics, Molecular Mechanics, Materials, Tools, Devices & Techniques, Special Topics.

Carbon-Based Polymer Nanocomposites for Environmental and Energy Applications provides the fundamental physico-chemical characterizations of recently explored carbon-based polymer nanocomposites, such as carbon nanotubes, graphene and its derivatives, nanodiamond, fullerenes and other nano-sized carbon allotropes. The book also covers the applications of carbon-based polymer nanocomposite in the environmental and energy fields. Topics range from the various approaches that have been explored and developed for the fabrication of carbon-based polymer nanocomposite, to their applications in tackling environmental and energy related issues. Provides a clear picture of the current state-of-the-art and future trends in carbon-based polymer nanomaterials Explains the interactions between nanofiller-

polymer matrices and mechanisms related to applications in environmental pollution and energy shortage Includes computational and experimental studies of the physical and chemical properties of carbon-based polymer nanocomposites Features chapters written by world leading experts

The first systematic reference on the topic with an emphasis on thecharacteristics and dimension of the reinforcement. This first of three volumes, authored by leading researchers inthe field from academia, government, industry, as well as privateresearch institutions around the globe, focuses on macro and microcomposites. Clearly divided into three sections, the first offers anintroduction to polymer composites, discussing the state of theart, new challenges, and opportunities of various polymer compositesystems, as well as preparation and manufacturing techniques. Thesecond part looks at macro systems, with an emphasis on fiberreinforced polymer composites, textile composites, and polymerhybrid composites. Likewise, the final section deals with microsystems, including micro particle reinforced polymer composites,the synthesis, surface modification and characterization of microparticulate fillers and flakes as well as filled polymer microcomposites, plus applications and the recovery, recycling and lifecycle analysis of synthetic polymeric composites.

High-Performance Apparel: Materials, Development, and Applications covers the materials and techniques used in creating high-performance apparel, the technical aspects of developing high-performance garments, and an array of applications for high-performance clothing and wearable technology. Part One covers fabric construction for high-performance garments, from fiber types and spinning methods, to weaving, knitting, finishing, and joining techniques. Development of high-performance apparel is covered in Part Two, with particular emphasis on design and product development for function and wearer comfort. Part Three covers a range of applications and wearable technology that make use of high-performance apparel, including chapters on sportswear, protective clothing, and medical, military, and intelligent textiles. The book provides an excellent resource for all those engaged in garment development and production, and for academics engaged in research into apparel technology and textile science. Offers a range of perspectives on high-performance apparel from an international team of authors with diverse expertise Provides systematic and comprehensive coverage of the topic from fabric construction, through apparel design and development, to the range of current and potential applications Presents an excellent resource for all those engaged in garment development and production, and for academics engaged in research

Graphite, Graphene, and Their Polymer Nanocomposites presents a compilation of emerging research trends in graphene-based polymer nanocomposites (GPNC). International researchers from several disciplines share their expertise about graphene, its properties, and the behavior of graphene-based composites. Possibly the first published monograph of its

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The book series 'Polymer Nano-, Micro- and Macrocomposites' provides complete and comprehensive information on all important aspects of polymer composite research and development, including, but not limited to synthesis, filler modification, modeling, characterization as well as application and commercialization issues. Each book focuses on a particular topic and gives a balanced in-depth overview of the respective subfield of polymer composite science and its relation to industrial applications. With the books the readers obtain dedicated resources with information relevant to their research, thereby helping to save time and money. Summarizing all the most important synthesis techniques used in the lab as well as in industry, this book is comprehensive in its coverage from chemical, physical and mechanical viewpoints. This book helps readers to choose the correct synthesis route, such as suspension and miniemulsion polymerization, living polymerization, sonication, mechanical methods or the use of radiation, and so achieve the desired composite properties.

The integration of electronics into textiles and clothing has opened up an array of functions beyond those of conventional textiles. These novel materials are beginning to find applications in commercial products, in fields such as communication, healthcare, protection and wearable technology. Electronic Textiles: Smart Fabrics and Wearable Technology opens with an initiation to the area from the editor, Tilak Dias. Part One introduces conductive fibres, carbon nano-tubes and polymer yarns. Part Two discusses techniques for integrating textiles and electronics, including the design of textile-based sensors and actuators, and energy harvesting methods. Finally, Part Three covers a range of electronic textile applications, from wearable electronics to technical textiles featuring expert chapters on embroidered antennas for communication systems and wearable sensors for athletes. Comprehensive overview of conductive fibres, yarns and fabrics for electronic textiles Expert analysis of textile-based sensors design, integration of micro-electronics with yarns and photovoltaic energy harvesting for intelligent textiles Detailed coverage of applications in electronic textiles, including werable sensors for athletes, embroidered antennas for communication and electronic textiles for military personnel

Electrospun Nanofibers covers advances in the electrospinning process including characterization, testing and modeling of electrospun nanofibers, and electrospinning for particular fiber types and applications. Electrospun Nanofibers offers systematic and comprehensive coverage for academic researchers, industry professionals, and postgraduate students working in the field of fiber science. Electrospinning is the most commercially successful process for the production of nanofibers and rising demand is driving research and development in this field. Rapid progress is being made both in terms of the electrospinning process and in the production of nanofibers with superior chemical and physical properties. Electrospinning is becoming more efficient and more specialized in order to produce particular fiber types such as bicomponent and composite fibers, patterned and 3D nanofibers, carbon nanofibers and nanotubes, and nanofibers derived from chitosan. Provides systematic and comprehensive coverage of the manufacture, properties, and applications of nanofibers Covers recent developments in nanofibers materials including electrospinning of bicomponent, chitosan, carbon, and conductive fibers Brings together expertise from academia and industry to provide comprehensive, up-to-date information on nanofiber research and development Offers systematic and comprehensive coverage for academic researchers, industry

professionals, and postgraduate students working in the field of fiber science
The production of ‘polymer nanocomposites’ has recently gained considerable attention from both the academic and industrial community, especially in the area of nanoscience. This is mainly due to their enhanced improvements in physico-mechanical, thermal and barrier properties compared to micro and more conventional composites. Their nanoscale dimensions, biodegradable character, cost-effectiveness and sustainability have constituted a stimulus for this increasing interest. Currently there is no limit to the possibility of applications. However, despite all this progress, it is still difficult to achieve uniform dispersion between the filler and the matrix, as agglomerations form far too easily and the production of polymer nanocomposites with high mechanical and thermal properties is still limited. The authors of this proposed book, are of the opinion, that with the increase in scientific publications and the rapid progress in processing possibilities to produce nanocomposites based on various nanoscale fillers (silica/clay), a book that collects all of these scientific findings in one place would be timely and of great interest to both students and scientific researchers, who are concerned with the production, and application of nanocomposites as new innovative materials. The authors aim is to present the latest research findings on the fabrication, properties and applications of nanofillers as reinforcement in polymer nanocomposites. Particular emphasis will be placed on the introduction of various nanofillers (silica/clay) into different elastomeric polymer matrices that will enhance the properties of these materials and their applications. The book will provide an up-to-date review of major innovations in the field and act as a reference for future research in materials science and engineering, which is highly topical due to the demand to produce more sustainable and eco-friendly innovative advanced materials from elastomeric polymers. Emphasis on silica/clay as outstanding reinforcing potential in elastomeric polymer matrices Up-to-date on the most relevant innovations in the field of silica/clay nanocomposites and their extensive applications in advanced material science Establishes the most suitable fabrication methods, properties and applications as a solid foundation in materials science and engineering disciplines Includes the incorporation of dual nanofillers that significantly improve the properties of nanocomposites
Functionalized Graphene Nanocomposites and Their Derivatives: Synthesis, Processing and Applications explains how the functionalization technique is used to create graphene nanocomposites, also exploring its current uses in industrial applications. Graphene-based nanocomposites are one of the major advancements in polymer-based materials, thus the synthesis, nanoscale dimensions, high aspect ratio, mechanical, electrical and thermal properties of graphene and its derivative have all been major areas of research in the last decade. This important reference covers these updates and is a critical book for those working in the fields of materials processing and characterization. Explains how graphene is functionalized and used in the fabrication of nanocomposites for a range of applications Explores why the properties of functionalized graphene make it such a useful, versatile material Describes, in detail, the functionalization process for utilization in graphene
Polyaniline Blends, Composites, and Nanocomposites summarizes recent advances in polyaniline-based blends, composites and nanocomposites. Polyaniline (PANI) is a conducting polymer with a range of potential applications, particularly in electronics and packaging. The book covers the preparation, characterization and application of PANI-based composites, including the structure-property relationship and modification of PANI. Offers an in-depth update on the major findings and observations in the field of polyaniline-based blends, composites and nanocomposites, with contributions from leading researchers in industry, academia, government and private research institutions worldwide. An application-oriented, practical guide to the development and application of this polymeric material. The book includes discussion of reinforcement of polyaniline via addition of carbon-based materials, blends with thermoplastics, thermosets, natural and synthetic rubber, and polyaniline based

composites and nanocomposites, with an emphasis on enabling polymer scientists and engineers to more effectively utilize this material in new applications. Includes an in-depth update on the state of research into this exciting material, with detailed and practical information for developing emerging applications of polyaniline Enables polymer scientists and engineers to overcome challenges and take advantage of opportunities relating to polyaniline, e.g., solubility of the polymer, improving conductivity and more Includes detailed coverage of the preparation, characterization and application of PANI-based composites in detail, along with the structure-property relationship and modification of PANI

This book offers a comprehensive review of the latest advances in developing functional electrospun nanofibers for energy and environmental applications, which include fuel cells, lithium-ion batteries, solar cells, supercapacitors, energy storage materials, sensors, filtration materials, protective clothing, catalysis, structurally-colored fibers, oil spill cleanup, self-cleaning materials, adsorbents, and electromagnetic shielding. This book is aimed at both newcomers and experienced researchers in the field of nanomaterials, especially those who are interested in addressing energy-related and environmental problems with the help of electrospun nanofibers. Bin Ding, PhD, and Jianyong Yu, PhD, are both Professors at the College of Materials Science and Engineering, Donghua University, China.

Nanomaterials-Based Coatings: Fundamentals and Applications presents the fundamental concepts and applications of nanomaterial-based coatings in anticorrosion, antiwear, antibacterial, antifungal, self-cleaning, superhydrophobic, super hard, super heat resistance, solar reflective, photocatalytic and radar absorbing coatings. It is an important resource for those seeking to understand the underlying phenomenal and fundamental mechanisms through which nanoparticles interact with polymeric and metallic matrices to create stronger coatings. As nanomaterials-enforced coatings are smarter, stronger and more durable, the information listed in this book will helps readers understand their usage and further applications. Highlights the latest methods in design, preparation and characterization techniques for nanomaterials-based coatings Discusses emerging applications of nanomaterials-based coatings, including substrates protection, sustainable energy, and in the environment and healthcare Assesses the major challenges in making nanomaterials-based coatings more reliable and cost-effective

This book has emerged out of our long-time research interests on the topic of latex film formation. Over the years we have built up a repertoire of slides used in conference presentations, short courses and tutorials on the topic. The story presented in this book has thereby taken shape as it has been told and re-told to a mix of academic and industrial audiences. The book presents a wide body of work accumulated by the polymer colloids community over the past five decades, but the selection of examples has been flavoured by our particular experimental interests and development of mathematical models. We intend the book to be a starting point for academic and industrial scientists beginning research on latex film formation. The emphasis is on fundam- tal mechanisms, however, and not on applications nor on specific effects of formu- tions. We hope that the book consolidates the understanding that has been achieved to-date in the literature in a more comprehensive way than is possible in a review article. We trust that the reader will appreciate the fascination of the topic.

The improvement of strength and durability in polymers has implications relevant to industrial, medical, and household applications. Enhanced by the improved knowledge of the interactions between complex hierarchical structures and functional requirements, Mechanical Properties of Polymers Based on Nanostructure and Morphology focuses on new polymer materials that possess a combination of improved

mechanical and other physical properties. This book specifies techniques used in structural and morphological characterization, discusses crazing and molecular variables of fracture behavior, and clarifies various modes of deformation mechanisms and orientation processes for semicrystalline polymers, block copolymers, and composites. The volume examines microindentation hardness studies and mechanisms of toughness enhancement for particle modified, amorphous and semicrystalline polymers and blends using model analysis. Experts in the field present innovations that illustrate new aspects of manufacturing, structure development, and properties of practical relevance in nanoparticle-filled thermoplastic polymers and the applications of carbon nanotube and nanofiber reinforced polymer systems. Other topics discussed in the book include alternative methods of polymer modification based on micro- and nanolayered polymers and hot compaction of oriented fibers and tapes. This book reflects the continuing research of mechanisms contributing to the structure-function relationship of nanostructured polymers and nanocomposites. Mechanical Properties of Polymers Based on Nanostructure and Morphology presents effective ways to combine improved mechanical and physical properties in polymers and form new, performance-enhanced composite materials.

In recent years, we have assisted the remarkable growth in the use of functional polyesters. This book gathers novel research works dealing with the manufacturing and characterization of polyesters that have been functionalized by synthesis, copolymerization, additives (at micro- and nanoscale), surface modification, among other methodologies, to tailor desired properties in terms of mechanical, chemical, thermal, and barrier properties, biodegradation, and biocompatibility. Thus, Advances in Manufacturing and Characterization of Functional Polyesters will serve to guide a diverse audience of polymer scientists and engineers and provides an update of the “state-of-the-art” knowledge on functional polyesters.

Progress in Rubber Nanocomposites provides an up-to-date review on the latest advances and developments in the field of rubber nanocomposites. It is intended to serve as a one-stop reference resource to showcase important research accomplishments in the area of rubber nanocomposites, with particular emphasis on the use of nanofillers. Chapters discuss major progress in the field and provide scope for further developments that will have an impact in the industrial research area. Global leaders and researchers from industry, academia, government, and private research institutions contribute valuable information. A one-stop reference relating to the processing and characterization of rubber nanocomposites Presents the morphological, thermal, and mechanical properties that are discussed in detail Contains key highlights in the form of dedicated chapters on interphase characterization, applications, and computer simulation

Technological advancements continue to enhance the field of engineering and have led to progress in branches that include electrical and mechanical engineering. These technologies have allowed for more sophisticated circuits and components while also advancing renewable energy initiatives. With increased growth in these fields, there is a need for a collection of research that details the variety of works being studied in our globalized world. The Handbook of Research on Recent Developments in Electrical and Mechanical Engineering is a pivotal reference source that discusses the latest advancements in these engineering fields. Featuring research on topics such as

materials manufacturing, microwave photons, and wireless power transfer, this book is ideally designed for graduate students, researchers, engineers, manufacturing managers, and academicians seeking coverage on the works and experiences achieved in electrical and mechanical engineering.