

## Material Science And Engineering Vijaya Rangarajan

This volume includes selected papers presented at the International Conference on Advances in Physical Metallurgy (ICPM-94). These 72 articles highlight important concepts of physical metallurgy, including those which have proliferated in various related disciplines such as ceramics, electronic materials, multilayers, and intermetallics. The first few sections of the book concentrate on materials in different states of order and the mechanisms involved in the evolution of order. Microstructural changes that occur by diffusional or displacive transformations are also discussed. Aspects of phase stability, including first principles calculations of phase stability, are covered in a separate section. The last three sections are devoted to the application of physical metallurgy principles to the development of specific materials.

This is the seventh set of Handbook of Porphyrin Science. Porphyrins, phthalocyanines and their numerous analogue and derivatives are materials of tremendous importance in chemistry, materials science, physics, biology and medicine. They are the red color in blood (heme) and the green in leaves (chlorophyll); they are also excellent ligands that can coordinate with almost every metal in the Periodic Table. Grounded in natural systems, porphyrins are incredibly versatile and can be modified in many ways; each new modification yields derivatives, demonstrating new chemistry, physics and biology, with a vast array of medicinal and technical applications. As porphyrins are currently employed as platforms for study of theoretical principles and applications in a wide variety of fields, the Handbook of Porphyrin Science represents a timely ongoing series dealing in detail with the synthesis, chemistry, physicochemical and medical properties and applications of polypyrrole macrocycles. Professors Karl Kadish, Kevin Smith and Roger Guilard are internationally recognized experts in the research field of porphyrins, each having his own separate area of expertise in the field. Between them, they have published over 1500 peer-reviewed papers and edited more than three dozen books on diverse topics of porphyrins and phthalocyanines. In assembling the new volumes of this unique handbook, they have selected and attracted the very best scientists in each sub-discipline as contributing authors. This handbook will prove to be a modern authoritative treatise on the subject as it is a collection of up-to-date works by world-renowned experts in the field. Complete with hundreds of figures, tables and structural formulas, and thousands of literature citations, all researchers and graduate students in this field will find the Handbook of Porphyrin Science an essential, major reference source for many years to come. Keeping in mind the advantages of bio-based materials, this book focuses on the potential efficacy of different biocomposites procured from diverse natural resources and the preparation and processing of the biocomposites to be used for a variety of applications. Each chapter gives an overview on a particular biocomposite material and its processing and successful utilization for selected applications. The chapters summarize recently developed research on such topics as:

- Spider silk biocomposites
- Biogenic hydroxyapatite-based implant biocomposites
- Liquid crystals and cellulose derivatives biocomposites
- Bio-based epoxy resins
- Bio-based polyphenols and lignocellulosic fibers
- Wood-based biocomposites
- Flame retardant biocomposites
- Biocomposites for industrial noise control
- Cellulose-based bionanocomposites

Each individual chapter also focuses on the knowledge and understanding of the interfaces manifested in these biocomposites systems and the optimization of different parameters for novel properties. In addition to this, the book also summarizes the recent developments made in the area of injection molding of biocomposites, chemical functionalization of natural fibers, processing of biocomposites, and their applications in the automotive and biomedical industries. A number of critical issues and suggestions for future work are discussed, underscoring the roles of researchers for the efficient development of biocomposite materials through value addition to enhance their use.

The study of science of materials has become in recent years an integral part of virtually all university courses in engineering. The subject of material science is an essential component of engineering education. It was with this in mind that present book was written. This book is primarily aimed at explaining the basic concepts of the science of materials. This is an elementary textbook on material science for graduate students of science and engineering. This book is suitable for students and engineers working in the material science field. A design engineer must have a sound knowledge of the basic concepts of material science. The presentation is concise, clear and lucid. The book covers the syllabus of undergraduate engineering courses of Indian Universities. A number of solved numerical problems have been included in the book to help the students in their learning and understanding process. This book presents the synthesis, processing and application of selected functional biopolymers as new advanced materials. It reviews theoretical advances as well as experimental results, opening new avenues for researchers in the field of polymers and sustainable materials. The book covers various aspects, including the structural analysis of functional biopolymers based materials; functional biopolymer blends; films, fibers, foams, composites and different advanced applications. A special emphasis is on cellulose-based functional polymers, but other types of functional biopolymers (e.g. from chitosan, starch, or plant oils) are also described.

The increasing demand for environmentally friendly materials and the need for cheaper fibres points the search in the direction of natural products such as bark, leaves, scales or shells. The aim of this book is to provide a forum to review the recent advances in the area of plant and animal-based composites and identify possible trends for further developments.

This book exclusively focuses on the science and fundamentals of polymer gels, as well as the numerous advantages that polymer gel-based materials offer. It presents a comprehensive collection of chapters on the recent advances and developments in the core science and fundamentals of both synthetic and natural polymer-based gels, and pays particular attention to applications in the various research fields of biomedicine and engineering. Key topics addressed include: polysaccharide-based gels and their fundamentals; stimuli-responsive polymer gels; polymer gels applied to enzyme and cell immobilization; chitosan-based gels for cancer therapy; natural polymeric and gelling agents; radiation dosimetry; polymeric gels as vehicles for enhanced drug delivery across the skin; transport in and through gel; and polymer gel nanocomposites and functional gels. The book's extensive and highly topical coverage will appeal to researchers working in a broad range of fields in industry and academia alike.

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 4th volume of the Handbook is solely focused on the Functionalization of renewable materials. Some of the important topics include but not limited to: Chitosan-based bio sorbents: oil spill clean-up by textiles; pyridine and bipyridine end-functionalized polylactide; functional separation membranes from chitin and chitosan derivatives; acrylated epoxidized flaxseed oil bio-resin and its biocomposites; encapsulation of inorganic renewable nanofiller; chitosan coating on textile fibers for functional properties; surface functionalization of cellulose whiskers for nonpolar composites; impact of chemical treatment and the manufacturing process on mechanical, thermal and rheological properties of natural fibers based composites; biopolymers modification; review on fibers from natural resources; strategies to improve the functionality of starch based films; the effect of gamma-radiation on biodegradability of natural fibers; surface functionalization through vapor-phase assisted surface polymerization (VASP)

on natural materials from agricultural by-products; okra bast fiber as potential reinforcement element of biocomposites; silane coupling agent used in natural fiber/plastic composites; composites of olefin polymer /natural fibers: the surface modifications on natural fibers; surface functionalization of biomaterials; thermal and mechanical behaviors of bio-renewable fibres based polymer composites; natural and artificial diversification of starch; role of radiation and surface modification on bio-fiber for reinforced polymer composites.

**Nano-Bioremediation: Fundamentals and Applications** explores how nano-bioremediation is used to remedy environmental pollutants. The book's chapters focus on the design, fabrication and application of advanced nanomaterials and their integration with biotechnological processes for the monitoring and treatment of pollutants in environmental matrices. It is an important reference source for materials scientists, engineers and environmental scientists who are looking to increase their understanding of bioremediation at the nanoscale. The mitigation of environmental pollution is the biggest challenge to researchers and the scientific community, hence this book provides answers to some important questions. As an advanced hybrid technology, nano-bioremediation refers to the integration of nanomaterials and bioremediation for the remediation of pollutants. The rapid pace of urbanization, massive development of industrial sectors, and modern agricultural practices all cause a controlled or uncontrolled release of environmentally-related hazardous contaminants that are seriously threatening every key sphere, including the atmosphere, hydrosphere, biosphere, lithosphere, and anthroposphere. Explores the current and potential applications of nano-bioremediation in the remediation of hazardous pollutants  
Outlines the major properties and classes of nanomaterials that make them efficient bioremediation agents  
Assesses the major challenges of effectively implementing bioremediation techniques at the nanoscale

Explore the theory and applications of superatomic clusters and cluster assembled materials  
**Superatoms: Principles, Synthesis and Applications** delivers an insightful and exciting exploration of an emerging subfield in cluster science, superatomic clusters and cluster assembled materials. The book presents discussions of the fundamentals of superatom chemistry and their application in catalysis, energy, materials science, and biomedical sciences. Readers will discover the foundational significance of superatoms in science and technology and learn how they can serve as the building blocks of tailored materials, promising to usher in a new era in materials science. The book covers topics as varied as the thermal and thermoelectric properties of cluster-based materials and clusters for CO<sub>2</sub> activation and conversion, before concluding with an incisive discussion of trends and directions likely to dominate the subject of superatoms in the coming years. Readers will also benefit from the inclusion of: A thorough introduction to the rational design of superatoms using electron-counting rules  
Explorations of superhalogens, endohedrally doped superatoms and assemblies, and magnetic superatoms  
A practical discussion of atomically precise synthesis of chemically modified superatoms  
A concise treatment of superatoms as the building blocks of 2D materials, as well as superatom-based ferroelectrics and cluster-based materials for energy harvesting and storage  
Perfect for academic researchers and industrial scientists working in cluster science, energy materials, thermoelectrics, 2D materials, and CO<sub>2</sub> conversion, **Superatoms: Principles, Synthesis and Applications** will also earn a place in the libraries of interested professionals in chemistry, physics, materials science, and nanoscience.

February 20-21, 2017 Berlin, Germany Key Topics : Materials Science and Engineering, Nanotechnology, Biomaterials and Healthcare, Materials in Industry, Materials Chemistry, Materials Physics, Energy Materials, Metallurgy and Materials Science, Advanced Materials and Devices, Characterization and Testing of Materials, Entrepreneurs Investment Meet,

This book comprises selected papers from the Fourth International Conference on Materials and Manufacturing Engineering (ICMME 2019). The contents focus on the latest developments in the synthesis and characterization of new materials, and highlights the challenges involved in the manufacturing and machinability of different materials. Advanced and cost-effective manufacturing processes and their applications are also discussed in the book. In addition, it covers topics like robotics, fluid dynamics, design and development, and different optimization techniques. The contents of this book will be beneficial to students, researchers, and industry professionals.

The increasing consumption of different kinds of polymer based materials results in huge amount of waste materials. Once the polymers have fulfilled the function for which they have been manufactured, they are disposed of in landfills in large amounts each year, which is incompatible with current environmental goals. The disposal of polymer based plastics such as incineration and landfill results in environmental pollution and land occupation. These current levels of polymer disposal are not sustainable and polymer recycling, which is one of the most important actions currently available to reduce the negative impacts, receives increasing attention. Recycling provides opportunities to reduce oil usage, carbon dioxide emissions and the quantities of polymer wastes, as well as the negative impacts of disposal. Using recycled polymer wastes to replace virgin materials in some applications, such as non-food packaging and automotive components, can effectively decrease the demand of the amount of import oil and conserve raw materials. Further it can also lead to the energy saving and creating new jobs. Considering all the positive impacts of polymer recycling on environment, economy and society, considerable attention is being given to recover materials from polymer wastes. This book is ideal for all those who are interested in recycling of post-consumer polymer waste. It is the outcome of untiring efforts of the researchers with extensive experience in the field of recycled polymers. The book enables the reader to gain a thorough understanding of the chemistry and processing of recycled polymers and also provides an instrumental resource for those already working in this field. Some of the main features are: Highlights the chemistry of recycled polymers and compares with traditional polymers Discusses the processing of different kinds of recycled polymers Highlights new frontiers in the different processing techniques Evaluates the performance of recycled polymers Focus on recyclability and up-to date progress on recycled polymers Present state of polymer recycling

Global awareness of environmental issues has resulted in the emergence of economically and environmentally friendly bio-based materials free from the traditional side effects of synthetics. This book delivers an overview of the advancements made in the development of natural biorenewable resources-based materials, including processing methods and potential applications in green composites. Biorenewable polymers are a special class of natural material found in nature, such as natural fibers, wheat straw, rice husk, and saw dust. In addition to offering renewable feedstocks, natural biorenewable materials are compostable, recyclable, edible, and more energy

efficient to process than plastic. Green Composites from Natural Resources covers various kinds of cellulosic biofibers, such as: hemp fibers jute saccharum cilliare fibers pine needles grewia optiva fibers sisal fibers eulaliopsis binata flax fibers coconut fibers eulaliopsis binata baggase fibers rice husk saw dust wood flour straw With scopes for the utilization of natural resources-based materials as potential replacements for traditional petroleum feedstocks on the rise, more scientists and researchers are exploring new composite materials based on biorenewable resources. This book provides information on more eco-friendly and sustainable alternatives to synthetic polymers and discusses the present state and growing utility of green materials from natural resources.

Over the years, many successful attempts have been chapters in this part describe the well-known processes made to describe the art and science of crystal growth, such as Czochralski, Kyropoulos, Bridgman, and o- and many review articles, monographs, symposium v- ing zone, and focus speci cally on recent advances in umes, and handbooks have been published to present improving these methodologies such as application of comprehensive reviews of the advances made in this magnetic elds, orientation of the growth axis, intro- eld. These publications are testament to the grow- duction of a pedestal, and shaped growth. They also ing interest in both bulk and thin- lm crystals because cover a wide range of materials from silicon and III–V of their electronic, optical, mechanical, microstructural, compounds to oxides and uorides. and other properties, and their diverse scienti c and The third part, Part C of the book, focuses on - technological applications. Indeed, most modern ad- lution growth. The various aspects of hydrothermal vances in semiconductor and optical devices would growth are discussed in two chapters, while three other not have been possible without the development of chapters present an overview of the nonlinear and laser many elemental, binary, ternary, and other compound crystals, KTP and KDP. The knowledge on the effect of crystals of varying properties and large sizes. The gravity on solution growth is presented through a c- literature devoted to basic understanding of growth parison of growth on Earth versus in a microgravity mechanisms, defect formation, and growth processes environment.

This book addresses the multidisciplinary challenges in biodiversity conservation with a focus on wildlife crime and how forensic tools can be applied to protect species and preserve ecosystems. Illustrated by numerous case studies covering different geographical regions and species the book introduces to the fundamentals of biodiversity conflicts, outlines the unique challenges of wildlife crime scenes and reviews latest techniques in environmental forensics, such as DNA metagenomics. In addition, the volume explores the socio-economic perspective of biodiversity protection and provides an overview of national and international conservation laws. The field of conservation medicine stresses the importance of recognizing that human health, animal health, and ecosystem health are inextricably interdependent. The book addresses graduate students, scientists and veterinary professionals working in wildlife research and conservation biology.

Non-Thermal Plasma Technology for Polymeric Materials: Applications in Composites, Nanostructured Materials and Biomedical Fields provides both an introduction and practical guide to plasma synthesis, modification and processing of polymers, their composites, nanocomposites, blends, IPNs and gels. It examines the current state-of-the-art and new

challenges in the field, including the use of plasma treatment to enhance adhesion, characterization techniques, and the environmental aspects of the process. Particular attention is paid to the effects on the final properties of composites and the characterization of fiber/polymer surface interactions. This book helps demystify the process of plasma polymerization, providing a thorough grounding in the fundamentals of plasma technology as they relate to polymers. It is ideal for materials scientists, polymer chemists, and engineers, acting as a guide to further research into new applications of this technology in the real world. Enables materials scientists and engineers to deploy plasma technology for surface treatment, characterization and analysis of polymeric materials Reviews the state-of-the-art in plasma technology for polymer synthesis and processing Presents detailed coverage of the most advanced applications for plasma polymerization, particularly in medicine and biomedical engineering, areas such as implants, biosensors and tissue engineering

**Piezoelectric Materials and Devices: Applications in Engineering and Medical Sciences** provides a complete overview of piezoelectric materials, covering all aspects of the materials starting from fundamental concepts. The treatment includes physics of piezoelectric materials, their characteristics and applications. The author uses simple language to explain the theory of piezoelectricity and introduce readers to the properties and design of different types of piezoelectric materials, such as those used in engineering and medical device applications. This book: Introduces various types of dielectrics and their classification based on their characteristics Addresses the mathematical formulation of piezoelectric effects and the definition of various piezoelectric constants Describes the structure and properties of practical piezoelectric materials such as quartz, lead zirconate titanate, barium titanate, zinc oxide, and polyvinylidene fluoride Covers the entire gamut of piezoelectric devices used in engineering and medical applications Discusses briefly the use of piezoelectric materials for energy harvesting and structural health monitoring Explores new developments in biomedical applications of piezoelectric devices such as drug delivery, blood flow and blood pressure monitoring, robotic operating tools, etc. Elaborates on design and virtual prototyping of piezoelectric devices through the use of FE software tools ANSYS and PAFEC Giving design engineers, scientists, and technologists the information and guidance they will need to adopt piezoelectric materials in the development of smart devices, this book will also motivate engineering and science students to initiate new research for developing innovative devices. Its contents will be invaluable to both students and professionals seeking a greater understanding of fundamentals and applications in the evolving field of piezoelectrics.

This well-established and widely adopted book, now in its Sixth Edition, provides a thorough analysis of the subject in an easy-to-read style. It analyzes, systematically and logically, the basic concepts and their applications to enable the students to comprehend the subject with ease. The book begins with a clear exposition of the background topics in chemical equilibrium, kinetics, atomic structure and chemical bonding. Then follows a detailed discussion on the structure of solids, crystal imperfections, phase diagrams, solid-state diffusion and phase transformations. This provides a deep insight into the structural control necessary for optimizing the various properties of materials. The mechanical properties covered include elastic, anelastic and viscoelastic behaviour, plastic deformation, creep and fracture phenomena. The next four chapters are devoted to a detailed description of electrical conduction, superconductivity, semiconductors, and magnetic and dielectric properties. The final chapter on 'Nanomaterials' is an important addition to the sixth edition. It describes the state-of-art developments in this new field. This eminently readable and student-friendly text not only provides a masterly analysis of all the relevant topics, but also makes them comprehensible to the students through the skillful use of well-drawn diagrams, illustrative tables, worked-out examples, and in many other ways. The book is primarily intended for undergraduate students of all branches of engineering (B.E./B.Tech.) and postgraduate

students of Physics, Chemistry and Materials Science. KEY FEATURES • All relevant units and constants listed at the beginning of each chapter • A note on SI units and a full table of conversion factors at the beginning • A new chapter on 'Nanomaterials' describing the state-of-art information • Examples with solutions and problems with answers • About 350 multiple choice questions with answers

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.

Collection of selected, peer reviewed papers from the 2014 2nd International Conference on Mechanical Structures and Smart Materials (2nd ICMSSM 2014), August 16-17, 2014, Kuala Lumpur, Malaysia. The 120 papers are grouped as follows: Chapter 1: Materials Science, Chapter 2: Material Properties and Processing Technologies, Chapter 3: Applied Mechanic and Engineering Design, Chapter 4: Mechanical Engineering and Control Systems, Chapter 5: Researches of Transmission Line Construction, Chapter 6: Civil Engineering and Information Technologies.

Biopolymer Grafting: Synthesis and Properties presents the latest research and developments in fundamental of synthesis and properties of biopolymer-based graft copolymers. The book presents a broad overview of the biopolymer grafting process, along with trends in the field. It also introduces a range of grafting methods which lead to materials with enhanced properties for a range of practical applications, along with the positives and limitations of these techniques. The book bridges the knowledge gap between the scientific principles and industrial applications of polymer grafting. This book covers synthesis and characterization of graft-copolymers of plant polysaccharides, functional separation membranes from grafted biopolymers, and polysaccharides in alternative methods for insulin delivery. Recent trends and advances in this area are discussed, assisting materials scientists and researchers in mapping out the future of these new "green" materials through value addition to enhance their use. Introduces polymer researchers to a promising, rapidly developing method for modifying naturally derived biopolymers Provides a one-stop shop covering synthesis, properties, characterization and graft copolymerization of bio-based polymeric materials Increases familiarity with a range of biopolymer grafting processes, enabling materials scientists and engineers to improve material properties and widen the range of potential biopolymer applications

Concise Polymeric Materials Encyclopedia culls the most used, widely applicable articles from the Polymeric Materials Encyclopedia - more than 1,100 - and presents them to you in a condensed, well-ordered format. Featuring contributions from more than 1,800 scientists from all over the world, the book discusses a vast array of subjects related to the: synthesis, properties, and applications of polymeric materials development of modern catalysts in preparing new or modified polymers modification of existing polymers by chemical and physical processes biologically oriented polymers This comprehensive, easy-to-use resource on modern polymeric materials serves as an invaluable addition to reference collections in the polymer field.

The usage of nanoscience and nanotechnology in engineering directly links academic research in nanoscience and nanotechnology to industries and daily life. As a result, numerous nanomaterials, nanodevices and nanosystems for various engineering purposes have been developed and used for human betterment. This book, which consists of eight self-contained chapters, provides the essential theoretical knowledge and important experimental techniques required for the research and development on nanoscience and nanotechnology in engineering, and deals with the five key topics in this area — Nanoscience and Nanotechnology in Engineering is based on the many lectures and courses presented around the world by its authors.

This book provides the necessary fundamentals and background for researchers and research professionals working in the field of 3D bioprinting in tissue engineering. In 3D bioprinting, design and development of the biomaterial-inks/bio-inks is a major challenge in providing 3D microenvironments specific to anatomical and architectural demands of native tissues. The focal point of this book is to provide the basic chemistry of biomaterials, updates on current processing, developments, and challenges, and recent advancements in tissue-specific 3D printing/bioprinting. This book is will serve as a go-to reference on bioprinting and is ideal for students, researchers and professionals, working academia, government, the medical industry, and healthcare.

Advanced materials are essential for economic security and human well-being, with applications in industries aimed at addressing challenges in clean energy, national security, and human welfare. Yet, it can take years to move a material to the market after its initial discovery. Computational techniques have accelerated the exploration and development of materials, offering the chance to move new materials to the market quickly. Computational Technologies in Materials Science addresses topics related to AI, machine learning, deep learning, and cloud computing in materials science. It explores characterization and fabrication of materials, machine-learning-based models, and computational intelligence for the synthesis and identification of materials. This book • Covers material testing and development using computational intelligence • Highlights the technologies to integrate computational intelligence and materials science • Details case studies and detailed applications • Investigates challenges in developing and using computational intelligence in materials science • Analyzes historic changes that are taking place in designing materials. This book encourages material researchers and academics to develop novel theories and sustainable computational techniques and explores the potential for computational intelligence to replace traditional materials research.

The authoritative introduction to all aspects of plastics engineering — offering both academic and industry perspectives in one complete volume. Introduction to Plastics Engineering provides a self-contained introduction to plastics engineering. A unique synergistic approach explores all aspects of material use — concepts, mechanics, materials, part design, part fabrication, and assembly — required for converting plastic materials, mainly in the form of small pellets, into useful products. Thermoplastics, thermosets, elastomers, and advanced

composites, the four disparate application areas of polymers normally treated as separate subjects, are covered together. Divided into five parts — Concepts, Mechanics, Materials, Part Processing and Assembly, and Material Systems — this inclusive volume enables readers to gain a well-rounded, foundational knowledge of plastics engineering. Chapters cover topics including the structure of polymers, how concepts from polymer physics explain the macro behavior of plastics, evolving concepts for plastics use, simple mechanics principles and their role in plastics engineering, models for the behavior of solids and fluids, and the mechanisms underlying the stiffening of plastics by embedded fibers. Drawing from his over fifty years in both academia and industry, Author Vijay Stokes uses the synergy between fundamentals and applications to provide a more meaningful introduction to plastics. Examines every facet of plastics engineering from materials and fabrication methods to advanced composites Provides accurate, up-to-date information for students and engineers both new to plastics and highly experienced with them Offers a practical guide to large number of materials and their applications Addresses current issues for mechanical design, part performance, and part fabrication Introduction to Plastics Engineering is an ideal text for practicing engineers, researchers, and students in mechanical and plastics engineering and related industries.

Nanosensors for Smart Cities covers the fundamental design concepts and emerging applications of nanosensors for the creation of smart city infrastructures. Examples of major applications include logistics management, where nanosensors could be used in active transport tracking devices for smart tracking and tracing, and in agri-food productions, where nanosensors are used in nanochips for identity, and food inspection, and smart storage. This book is essential reading for researchers working in the field of advanced sensors technology, smart city technology and nanotechnology, and stakeholders involved in city management. Nanomaterials based sensors (nanosensors) can offer many advantages over their microcounterparts, including lower power consumption, high sensitivity, lower concentration of analytes, and smaller interaction distance between object and sensor. With the support of artificial intelligence (AI) tools, such as fuzzy logic, genetic algorithms, neural networks, and ambient-intelligence, sensor systems are becoming smarter. Provides information on the fabrication and fundamental design concepts of nanosensors for intelligent systems Explores how nanosensors are being used to better monitor and maintain infrastructure services, including street lighting, traffic management and pollution control Assesses the challenges for creating nanomaterials-enhanced sensors for mass-market consumer products ?This volume covers current research in the usage of magnetic nanoparticles for drug delivery. It discusses synthesis methods, stabilizers used for surface coating on MNPs, and potential target ligands which can be used to ferry payloads to the targeted disease region. It also highlights the factors affecting delivery efficiency and toxicity, as well as the different routes of administration. The content also

focus on the use of these carriers for gene therapy and to target brain tumors. This volume will be of interest to researchers working on drug discovery and delivery platforms.

**Cellulose-Based Graft Copolymers: Structure and Chemistry** discusses the synthesis, characterization, and properties of multifunctional cellulose-based graft copolymers. Presenting the contributions of accomplished experts in the field of natural cellulosic polymers, this authoritative text: Offers an overview of cutting-edge technical accomplishments in natural cellulose-based graft polymers Addresses a separate biomaterial in each chapter, exploring composition as well as graft copolymerization chemistry Covers fundamentals and applications including toxic ion removal, biomedical engineering, biofuels, micro/nano composites, papermaking, building materials, and defense Cellulose-Based Graft Copolymers: Structure and Chemistry tackles several critical issues and provides suggestions for future work, supplying deeper insight into the state of the art of advanced cellulose-based graft copolymers.

**Hybrid Polymer Composite Materials: Applications** provides a clear understanding of the present state-of-the-art and the growing utility of hybrid polymer composite materials. It includes contributions from world renowned experts and discusses the combination of different kinds of materials procured from diverse resources. In addition, this volume from the four volume series provides deep insights on the potential of hybrid polymer composite materials for advanced applications. Provides a clear understanding of the present state-of-the-art and the growing utility of hybrid polymer composite materials Includes contributions from world renowned experts and discusses the combination of different kinds of materials procured from diverse resources Discusses their synthesis, chemistry, processing, fundamental properties, and applications Provides insights on the potential of hybrid polymer composite materials for advanced applications

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.

Biopolymer Grafting: Applications presents the latest research and developments in the practical application of these methods in industry, both to enable polymer scientists and engineers to keep up with the latest research trends, as well as to propose ideas for further research and application. Research into bio-based polymers has become increasingly prevalent. However, due to challenges related to the properties of these materials compared to synthetic polymers—such as their resistance to chemicals or weather—uptake has not dramatically increased yet. As a result, improvements in surface modification of bio-polymers through graft copolymerization are enormously important, because they will widen the scope of their applications. Relevant industries for application of these methods include automotive, construction, food, packaging, agriculture, textiles and paper. This book provides an overview of the developments made in the area of biopolymer-based graft polymers. Advantages, disadvantages and suggestions for future works are discussed, assisting materials scientists and researchers in mapping out the future of these new "green" materials through value addition to enhance their use. Helps researchers and product developers understand the applications and limitations of biopolymer copolymers or copolymers of natural polymers Offers a roadmap to future applications development in a range of different industries, including automotive, biomedical and packaging Increases familiarity with a range of biopolymer grafting processes, enabling materials scientists and engineers to improve material properties and widen the range of potential biopolymer applications

Materials ScienceTata McGraw-Hill EducationAdvances in Materials and Manufacturing EngineeringSelect Proceedings of ICMME 2019Springer Nature The book provides a comprehensive overview of the authors' works which include significant discoveries and pioneering contributions on Materials Process Engineering, Materials Physics and Chemistry, Emerging Areas of Materials Science, and so on. AMSE2016 is an influential international conference for its strong organization team, dependable reputation and a wide range of sponsors from all over the world. Contents:Nano Science and TechnologyAdvances in Polymer Science and TechnologyMaterial Based Engineering Design and ControlMaterial CharacterizationMaterials Modeling and SimulationMaterials Engineering and PerformanceMaterials Science and Engineering Readership: Scientists from materials process engineering, material physics and chemistry. This highly informative and carefully presented book discusses the preparation, processing, characterization and applications of different types of hybrid nanomaterials based on nanocellulose and/or nanocarbons. It gives an overview

of recent advances of outstanding classes of hybrid materials applied in the fields of physics, chemistry, biology, medicine, and materials science, among others. The content of this book is relevant to researchers in academia and industry professionals working on the development of advanced hybrid nanomaterials and their applications.

This book presents selected papers from the international conference on advanced manufacturing and materials sciences (ICAMMS 2018). The papers reflect recent advances in manufacturing sector focusing on process optimization and give emphasis to testing and evaluation of new materials with potential use in industrial applications.

An in-depth look at the luminescence of phosphor materials for applications in optical devices, sensors, and medical technologies. *Optical Properties of Phosphate and Pyrophosphate Compounds* gives a broad introduction to pyrophosphates and phosphate-based phosphors, including their fundamental properties, material composition, synthesis methods, characterization techniques, and applications in optical devices and technologies. The text describes the development of the materials' shape and size, as well as crucial characterization techniques for key applications. Additionally, it includes essential information about recently used single and mixed cations pyrophosphate and phosphate compounds. This book is suitable for researchers working in materials science, engineering, materials chemistry, and physics. It may also be helpful to engineers and chemists working in R&D for solid state lighting. Includes comprehensive review of materials synthesis and characterization techniques for pyrophosphate and phosphate-based phosphor materials for key applications Discusses the fundamentals of luminescence and the optical properties of pyrophosphate and phosphate-based phosphor material Addresses key applications in optical devices, sensors, and medical technologies

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