Environmental Analysis by Electrochemical Sensors and Biosensors

The book provides readers with a broad view of the materials' perspectives, including historical context and background, along with future opportunities for smart electronic and switchable devices. A major focus in the book is on the research and development of synthetic materials for spectroscopic analysis which broadly deals with science and technology of materials on the atomic and molecular scale. The book reviews the materials and advances in research for switchable electronics for bioelectronic, sensing and optoelectronic applications. In addition, key challenges and emerging opportunities in innovations in surface modification and novel functional materials device implementation for industrial scale reproducibility are discussed. The book covers the applications and market potential for a variety of media, including mirrors, glazing/coatings, and display products. The physics, electrochemistry, device design and materials are detailed, with performance compared between the most relevant and emerging switchable technologies. Addresses the most interesting advances in switchable devices for bioelectronics, electronics, optoelectronics and sensing applications Includes a special emphasis on materials design, processing and fabrication of switchable devices to realize large-scale industry applications

Nanoparticle Technology Handbook

Through advanced characterization and new fabrication techniques, the physics, chemistry, and structure of functional materials have become a central focus of investigation in materials science, chemistry, physics, and engineering. This book presents a detailed overview of recent research developments on functional materials, including nanomaterials, synthesis, characterization, and applications. A series of chapters provides state-of-the-art information on structures and performance of polymer composites. This volume contains topical articles by prominent leaders in this field. The research presented discusses design principles, candidate materials and systems, and current advances, and serves as a useful source of insight into this field. This book provides a strong understanding of the primary types of materials and composites, as well as the relationships that exist between the structural elements of materials and their properties. The relationships among processing, structure, properties, and performance components are explored throughout the chapters.

Chemical Solution Synthesis for Materials Design and Thin Film Device Applications

The second provides an overview of the wide variety of materials that can be used for laser transfer processing, while the final section comprehensively discusses a number of practical uses, including printing of electronic materials, printing of 3D structures as well as large-area, high-throughput applications. The book is rounded off by a look at the future for laser printed materials. Invaluable reading for a broad audience ranging from material developers to mechanical engineers, from academic researchers to industrial developers and for those interested in the development of micro-scale additive manufacturing techniques.

Computational and Experimental Analysis of Functional Materials

Microstructure, Property and Processing of Functional Ceramics describes the preparation, property and local structure microscopy of functional ceramics. It covers functional ceramic fabrication processing, grain boundary phenomena and micro-, nanoscale structures characterizations including scanning electron acoustic microscopy, scanning probe acoustic microscopy and piezoresponse force.
Advanced Functional Materials: Compiles the objectives related to functional materials and provides detailed reviews of fundamentals, research on the processing, properties and technology developments of advanced functional materials and their applications. Specifically, these innovative methodologies and research strategies, as well as provides a comprehensive and detailed overview of the cutting-edge hybrid structures which are the necessary building blocks for the architecture of various advanced functional materials. The book discusses researchers, one will find the range of methods that have been developed for preparation and functionalization of organic, inorganic and energy conversion and storage, sensing, electronics, photonics, and biomedicine. Within the chapters of this book written by well-known authors to this book are a group of internationally distinguished researchers. This book consists of a collection of chapters divided into two sections, with the first section covering new applications and the second section covering materials and crystal structures topics to support future generations of optoelectronic devices and open the door for future, more demanding applications. This collection of chapters will be of considerable interest to scientists, engineers, physicists, and technologists working in research and development in the fields of optoelectronics and photonics, as well as to young researchers who are at the beginning of their career.

Functional Materials

Radiation Technology for Advanced Materials presents a range of radiation technology applications for advanced materials. The book aims to bridge the gap between researchers and industry, describing current uses and future prospects. It describes the mature radiation processing technology used in preparing heat shrinkable materials and in wire and cable materials, giving commercial cases. In addition, the book illustrates future applications, including high-performance fibers, special self-lubricating materials, special ultra-fine powder materials, civil fibers, natural polymeric materials, battery separator membranes, special filtration materials and metallic nanomaterials. Chapters cover radiation technology in high-performance fiber and functional textiles, radiation crosslinking and typical applications, radiation crosslinking for polymer foaming material, radiation degradation and application, radiation emulsion polymerization, radiation effects of Ionic liquids, radiation technology in advanced new materials, and future prospects. Presents a range of radiation technology applications and their application to advanced materials Covers the mature radiation processing technology used to prepare heat shrinkable materials and wire cable materials, describing real-world commercial applications Shows the promising application of radiation technology in preparing high-performance Si and carbon fibers Describes the radiation degradation/radiation effect used to prepare fine powder materials Discusses radiation modification and radiation grafting techniques used to synthesize materials, such as civil fibers, natural polymeric materials and others

Advanced Functional Materials

This book represents a unique collection of the latest developments in the rapidly developing world of optoelectronics. The contributing authors to this book are a group of internationally distinguished researchers. This book consists of a collection of chapters divided into two sections, with the first section covering new applications and the second section covering materials and crystal structures topics to support future generations of optoelectronic devices and open the door for future, more demanding applications. This collection of chapters will be of considerable interest to scientists, engineers, physicists, and technologists working in research and development in the fields of optoelectronics and photonics, as well as to young researchers who are at the beginning of their career.

Soft Robotics

Because of their unique properties (size, shape, and surface functions), functional materials are gaining significant attention in the areas of energy conversion and storage, sensing, electronics, photonics, and biomedicine. Within the chapters of this book written by well-known researchers, one will find the range of methods that have been developed for preparation and functionalization of organic, inorganic and hybrid structures which are the necessary building blocks for the architecture of various advanced functional materials. The book discusses these innovative methodologies and research strategies, as well as provides a comprehensive and detailed overview of the cutting-edge research on the processing, properties and technology developments of advanced functional materials and their applications. Specifically, Advanced Functional Materials: Compiles the objectives related to functional materials and provides detailed reviews of fundamentals, novel production methods, and frontiers of functional materials, including metallic oxides, conducting polymers, carbon nanotubes, discotic liquid crystalline dimers, calixarenes, crown ethers, chitosan and graphene. Discusses the production and characterization of these materials, while mentioning recent approaches developed as well as their uses and applications for sensitive chemiresistors, optical and electronic materials, solar hydrogen generation, supercapacitors, display and organic light-emitting diodes, functional adsorbents, and

Mechanical Alloying

Because of their unique properties (size, shape, and surface functions), functional materials are gaining significant attention in the areas of energy conversion and storage, sensing, electronics, photonics, and biomedicine. Within the chapters of this book written by well-known researchers, one will find the range of methods that have been developed for preparation and functionalization of organic, inorganic and hybrid structures which are the necessary building blocks for the architecture of various advanced functional materials. The book discusses these innovative methodologies and research strategies, as well as provides a comprehensive and detailed overview of the cutting-edge research on the processing, properties and technology developments of advanced functional materials and their applications. Specifically, Advanced Functional Materials: Compiles the objectives related to functional materials and provides detailed reviews of fundamentals, novel production methods, and frontiers of functional materials, including metallic oxides, conducting polymers, carbon nanotubes, discotic liquid crystalline dimers, calixarenes, crown ethers, chitosan and graphene. Discusses the production and characterization of these materials, while mentioning recent approaches developed as well as their uses and applications for sensitive chemiresistors, optical and electronic materials, solar hydrogen generation, supercapacitors, display and organic light-emitting diodes, functional adsorbents, and

Springer Handbook of Nanomaterials

As the characteristic dimensions of electronic devices continue to shrink, the ability to characterize their electronic properties at the nanometer scale has come to be of outstanding importance. In this sense, Scanning Probe Microscopy (SPM) is becoming an indispensable tool, playing a key role in nanoscience and nanotechnology. SPM is opening new opportunities to measure semiconductor electronic properties with unprecedented spatial resolution. SPM is being successfully applied for nanoscale characterization of ferroelectric thin films. In the area of functional molecular materials it is being used as a probe to contact molecular structures in order to characterize their electrical properties, as a manipulator to assemble nanoparticles and nanotubes into simple devices, and as a tool to pattern molecular nanostructures. This book provides in-depth information on new and emerging applications of SPM to the field of materials science, namely in the areas of characterisation, device application and nanofabrication of functional materials. Starting with the general properties of functional materials the authors present an updated overview of the fundamentals of Scanning Probe Techniques and the application of SPM techniques to the characterization of specified functional materials such as piezoelectric and ferroelectric and to the fabrication of some nano electronic devices. Its uniqueness is in the combination of the fundamental nanoscale research with the progress in fabrication of realistic nanodevices. By bringing together the contribution of leading researchers from the materials science and SPM communities, relevant information is conveyed that allows researchers to learn more about the actual developments in SPM applied to functional materials. This book will contribute to the continuous education and development in the field of nanotechnology.

Optoelectronics

Over the last few decades magnetism has seen an enormous expansion into a variety of different areas of research, notably the magnetism of several classes of novel materials that share with truly ferromagnetic materials only the presence of magnetic moments. Volume 23 of the Handbook of Magnetic Materials, like the preceding volumes, has a dual purpose. With contributions from leading authorities in the field, it includes a variety of self-contained introductions to a given area in the field of magnetism without requiring recourse to the published literature. It is also a reference for scientists active in magnetism research, providing readers with novel trends and achievements in magnetism. In each of these articles an extensive description is given in graphical as well as in tabular form, with much emphasis being placed on the discussion of the experimental material within the framework of physics, chemistry and material science. Comprises topical review articles written by leading authorities Introduces given topics in the field of magnetism Describes novel trends and achievements in magnetism

Nano Design for Smart Gels

This book presents an exhaustive overview of electrochemical sensors and biosensors for the analysis and monitoring of the most important analytes in the environmental field, in industry, in treatment plants and in environmental research. The chapters give the reader a comprehensive, state-of-the-art picture of the field of electrochemical sensors suitable to environmental analytes, from the theoretical principles of their design to their implementation, realization and application. The first three chapters discuss fundamentals, and the last three chapters cover the main groups of analytes of environmental interest.

Scanning Probe Microscopy: Characterization, Nanofabrication and Device Application of Functional Materials

The Handbook of Chitin and Chitosan: Chitin and Chitosan Based Polymer Materials for Various Applications, Volume Three, is a must-read for polymer chemists, physicists and engineers interested in the development of ecofriendly micro and nanostructured functional materials based on chitin and their various applications. The book addresses their isolation, preparation and properties and their composites, nanomaterials, manufacturing and characterizations. This is the third of three volumes in a series that contains the latest on the major applications of chitin and chitosan based IPN’s, blends, gels, composites and nanocomposites, including environmental remediation, biomedical applications and smart material applications. Provides a comprehensive overview of Chitin and Chitosan materials, from their synthesis and nanomaterials, to their manufacture and applications Volume Three focuses on the applications of Chitin and Chitosan Includes contributions from leading researchers across the globe and from industry, academia, government and private research institutions Highlights current status and future opportunities

Ion Beams in Materials Processing and Analysis

Handbook of Smart Photocatalytic Materials: Environment, Energy, Emerging Applications and Sustainability provides an intriguing and useful guide to catalysis and materials. The handbook covers applications of smart photocatalytic materials for energy environmental protection and emerging fields. Also covered is the safety risk of Smart Photocatalytic Materials, commercialization, their fate and transportation in the environment, and sustainability. This volume provides a valuable roadmap, outlining common principles behind their
use. Every chapter of this volume presents state-of-the-art knowledge on sustainable practices of smart photocatalytic materials (SPMs), including concepts of theory and practice. This handbook is a valued reference for both the academic and industrial researchers looking for recent developments in the field. Covers all aspects of recent developments in Environmental, Energy and Emerging applications of Smart Photocatalytic Materials Focuses on advanced applications and future research advancements of Smart Photocatalytic Materials Emphasizes the sustainability aspect of Smart Photocatalytic Materials Presents a valuable reference for researchers and students that stimulates interest in designing smart materials

**Functional Materials**

Lignocellulosics: Renewable Feedstock for (Tailored) Functional Materials and Nanotechnology gives a comprehensive overview of recent advances in using lignocellulosic substrates in materials science and nanotechnology. The functionalization and processing of lignocellulosics can be achieved via a number of examples that cover films, gels, sensors, pharmaceuticals and energy storage. In addition to the research related to functional cellulose nanomaterials, there has been an increased interest in research on lignin and lignocellulosics. This book explains how utilizing biomaterials as a raw material allows ambitious reconstruction of smart materials that are green and multifunctional. As lignin as a valuable material has gained a lot of attention in the last few years, shifting from purely extraction and fundamental characterization, and now also focusing on the preparation of exciting materials, such as nanoparticles, readers will find this to be a comprehensive resource on the topic. Provides a detailed description of functional lignocellulosic materials and their properties Brings together research advances in the areas of chemistry, chemical engineering, physics and materials science Concentrates on the fundamental properties of lignocellulose Includes unique coverage of lignin research

**Nanomaterials for Soil Remediation**

Global demand for low cost, efficient and sustainable energy production is ever increasing. Driven by recent discoveries and innovation in the science and technology of materials, applications based on functional materials are becoming increasingly important. Functional materials for sustainable energy applications provides an essential guide to the development and application of these materials in sustainable energy production. Part one reviews functional materials for solar power, including silicon-based, thin-film, and dye sensitized photovoltaic solar cells, thermophotovoltaic device modelling and photoelectrochemical cells. Part two focuses on functional materials for hydrogen production and storage. Functional materials for fuel cells are then explored in part three where developments in membranes, catalysts and membrane electrode assemblies for polymer electrolyte and direct methanol fuel cells are discussed, alongside electrolytes and ion conductors, novel cathodes, anodes, thin films and proton conductors for solid oxide fuel cells. Part four considers functional materials for demand reduction and energy storage, before the book concludes in part five with an investigation into computer simulation studies of functional materials. With its distinguished editors and international team of expert contributors, Functional materials for sustainable energy applications is an indispensable tool for anyone involved in the research, development, manufacture and application of materials for sustainable energy production, including materials engineers, scientists and academics in the rapidly developing, interdisciplinary field of sustainable energy. An essential guide to the development and application of functional materials in sustainable energy production Reviews functional materials for solar power Focuses on functional materials for hydrogen production and storage, fuel cells, demand reduction and energy storage

**Functional Materials for Sustainable Energy Applications**

Nanomaterials for Soil Remediation provides a comprehensive description on basic knowledge and current research progress in the field of soil treatment using nanomaterials. Soil pollution refers to the presence of toxic chemicals in soil. Compared with air and water remediations, soil remediation is technically more challenging due to its complex composition. The synergy between engineering and nanotechnology has resulted in rapid developments in soil remediation. Nanomaterials could offer new routes to address challenging and pressing issues facing soil pollution. This book aims to explore how nanomaterials are used to cleanse polluted soils (organic compounds and heavy metal-contaminated soils) through various nanomaterials-based techniques (chemical/physical/biological techniques and their integrations). Highlights how nanotechnology is being used to more accurately measure soil pollution levels Discusses how the properties of nanomaterials are being used to make more efficient soil remediation techniques and products Assesses the practical and regulatory challenges of using different nanomaterial-based products for soil repair

**Porous Materials**

Soft Robotics aims at providing state of art on research and potential approaches of soft robotics. It particularly challenges the traditional thinking of engineers, as the confluence of technologies, ranging from new materials, sensors, actuators and production techniques to new design tools, will make it possible to create new systems whose structures are almost completely made of soft materials, which bring about entirely new functions and behaviors, similar in many ways to natural systems. This is a huge research topic, “hot and with a huge potential due to new possibilities offered by these systems to cope with problems that cannot be addressed by robots built from rigid bodies. Chemical engineering can take part to the emerging field of soft robotics Soft and polymer materials can be used in sensing applications Soft robotics can solve many industrial issues and challenges

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**Metal and Metal Oxides for Energy and Electronics**

Functional Materials have assumed a very prominent position in several high tech areas. Such materials are not being classified on the basis of their origin, nature of bonding or processing techniques but are classified on the basis of the functions which they can perform. This is a significant departure from the earlier schemes in which materials were described as metals, alloys, ceramics, polymers, glass materials etc. Several new processing techniques have also evolved in the recent past. Because of the diversity of materials and their functions it has become extremely difficult to obtain information from single source. Functional Materials: Preparation, Processing and Applications provides a comprehensive review of the latest developments. Serves as a ready reference for Chemistry, Physics and Materials Science researchers by covering a wide range of functional materials in one book Aids in the design of new materials by emphasizing structure or microstructure – property correlation Covers the processing of functional materials in detail which helps in conceptualizing the applications of them

**Microstructure, Property and Processing of Functional Ceramics**

Sustainable Materials and Green Processing for Energy Conversion provides a concise reference on green processing and synthesis of materials required for the next generation of devices used in renewable energy conversion and storage. The book covers the processing of bio-organic materials, environmentally-friendly organic and inorganic sources of materials, synthetic green chemistry, bioresorbable and transient properties of functional materials, and the concept of sustainable material design. The book features chapters by worldwide experts and is an important reference for students, researchers, and engineers interested in gaining extensive knowledge concerning green processing of sustainable, green functional materials for next generation energy devices. Additionally, functional materials used in energy devices must also be able to degrade and decompose with minimum energy after being disposed of at their end-of-life. Environmental pollution is one of the global crises that endangers the life cycles of living things. There are multiple root causes of this pollution, including industrialization that demands a huge supply of raw materials for the production of products related to meeting the demands of the Internet-of-Things. As a result, improvement of material and product life cycles by incorporation of green, sustainable principles is essential to address this challenging issue. Offers a resourceful reference for readers interested in green processing of environmentally-friendly and sustainable materials for energy conversion and storage devices Focuses on designing of materials through green-processing concepts Highlights challenges and opportunities in green processing of sustainable materials for energy devices

**Infrared Detectors and Emitters: Materials and Devices**

Conducting Polymer-Based Nanocomposites: Fundamentals and Applications delivers an up-to-date overview on cutting-edge advancements in the field of nanocomposites derived from conjugated polymeric matrices. Design of conducting polymers and resultant nanocomposites has instigated significant addition in the field of modern nanoscience and technology. Recently, conducting polymer-based nanocomposites have attracted considerable academic and industrial research interest. The conductivity and physical properties of conjugated polymers have shown dramatic improvement with nanofiller addition. Appropriate fabrication strategies and the choice of a nanoreinforcement, along with a conducting matrix, may lead to enhanced physicochemical features and material performance. Substantial electrical conductivity, optical features, thermal stability, thermal conductivity, mechanical strength, and other physical properties of the conducting polymer-based nanocomposites have led to high-performance materials and high-tech devices and applications. This book begins with a widespread impression of state-of-the-art knowledge in indispensable features and processing of conducting polymer-based nanocomposites. It then discusses essential categories of conducting polymer-based nanocomposites such as polyaniline, polypyrrole, polythiophene, and derived nanomaterials. Subsequent sections of this book are related to the potential impact of conducting polymer-based nanocomposites in various technical fields. Significant application areas have been identified for anti-corrosion, EMI shielding, sensing, and energy device relevance. Finally, the book covers predictable challenges and future opportunities in the field of conjugated nanocomposites. Integrates the fundamentals of conducting polymers and a range of multifunctional applications Describes categories of essential conducting polymer-based nanocomposites for polyaniline, polypyrrole, polythiophene, and derivative materials Assimilates the significance of multifunctional nanostructured materials of nanocomposite nanofibers Portrays current and future demanding technological applications of conjugated polymer-based nanocomposites, including anti-corrosion coatings, EMI shielding, sensors, and energy production and storage devices

**Conducting Polymer-Based Nanocomposites**

Engineers and scientists alike will find this book to be an excellent introduction to the topic of porous materials, in particular the three main groups of porous materials: porous metals, porous ceramics, and polymer foams. Beginning with a general introduction to porous materials, the next six chapters focus on the processing and applications of each of the three main materials groups. The book includes such new processes as gel-casting and freeze-drying for porous ceramics and self-propagating high temperature synthesis (SHS) for porous metals. The applications discussed are relevant to a wide number of fields and industries, including aerospace, energy, transportation, construction, electronics, biomedical and others. The book concludes with a chapter on characterization methods for some basic parameters of porous materials. Porous Materials: Processing and Applications is an excellent resource for academic and industrial researchers in porous materials, as well as for upper-level undergraduate and graduate students in materials science and engineering, physics, chemistry, mechanics, metallurgy, and related specialties. A comprehensive overview of processing and applications of porous materials – provides
younger researchers, engineers and students with the best introduction to this class of materials. Includes three full chapters on modern applications - one for each of the three main groups of porous materials. Introduces readers to several characterization methods for porous materials, including methods for characterizing pore size, thermal conductivity, electrical resistivity and specific surface area.

**Polymeric Sensors and Actuators**

Mechanical Alloying: Energy Storage, Protective Coatings, and Medical Applications, Third Edition is a detailed introduction to mechanical alloying that offers guidelines on the necessary equipment and facilities needed to carry out the process, also giving a fundamental background to the reactions taking place. El-Eskandarany, a leading authority on mechanical alloying, discusses the mechanism of powder consolidations using different powder compaction processes. A new chapter is included on utilization of the mechanically alloyed powders for thermal spraying. Fully updated to cover recent developments in the field, this second edition also introduces new and emerging applications for mechanical alloying, including the fabrication of carbon nanotubes, surface protective coating and hydrogen storage technology. El-Eskandarany discusses the latest research into these applications and provides engineers and scientists with the information they need to implement these developments. Guides readers through each step of the mechanical alloying process. Includes tables and graphs that are used to explain the stages of the milling processes. Presents a comprehensive update on the previous edition, including new chapters that cover emerging applications.

**Laser Printing of Functional Materials**

This book is a comprehensive compilation of chapters on materials (both established and evolving) and material technologies that are important for aerospace systems. It considers aerospace materials in three parts. Part I covers Metallic Materials (Mg, Al, Al-Li, Ti, aero steels, Ni, intermetallics, bronzes and Nb alloys); Part II deals with Composites (GLARE, PMCs, CMCs and Carbon based CMCs); and Part III considers Special Materials. This compilation has ensured that no important aerospace material system is ignored. Emphasis is laid in each chapter on the underlying scientific principles as well as basic and fundamental mechanisms leading to processing, characterization, property evaluation and applications. This book will be useful to students, researchers and professionals working in the domain of aerospace materials.

**Functional Materials Processing for Switchable Device Modulation**

Chemical Solution Synthesis for Materials Design and Thin Film Device Applications presents current research on wet chemical techniques for thin-film based devices. Sections cover the quality of thin films, types of common films used in devices, various thermodynamic properties, thin film patterning, device configuration and applications. As a whole, these topics create a roadmap for developing new materials and incorporating the results in device fabrication. This book is suitable for graduate, undergraduate, doctoral students, and researchers looking for quick guidance on material synthesis and device fabrication through wet chemical routes. Provides the different wet chemical routes for materials synthesis, along with the most relevant thin film structured materials for device applications. Discusses patterning and solution processing of inorganic thin films, along with solvent-based processing techniques. Includes an overview of key processes and methods in thin film synthesis, processing and device fabrication, such as nucleation, lithography and solution processing.

**Polymer-Based Advanced Functional Materials for Energy and Environmental Applications**

Nanoparticle technology, which handles the preparation, processing, application and characterisation of nanoparticles, is a new and revolutionary technology. It becomes the core of nanotechnology as an extension of the conventional Fine Particle / Powder Technology. Nanoparticle technology plays an important role in the implementation of nanotechnology in many engineering and industrial fields including electronic devices, advanced ceramics, new batteries, engineered catalysts, functional paint and ink, Drug Delivery System, biotechnology, etc.; and makes use of the unique properties of the nanoparticles which are completely different from those of the bulk materials. This new handbook is the first to explain complete aspects of nanoparticles with many application examples showing their advantages and advanced development. There are handbooks which briefly mention the nanosized particles or their related applications, but no handbook describing the complete aspects of nanoparticles has been published so far. The handbook elucidates of the basic properties of nanoparticles and various nanostructural materials with their characterisation methods in the first part. It also introduces more than 40 examples of practical and potential uses of nanoparticles in the later part dealing with applications. It is intended to give readers a clear picture of nanoparticles as well as new ideas or hints on their applications to create new materials or to improve the performance of the advanced functional materials developed with the nanoparticles. * Introduces all aspects of nanoparticle technology, from the fundamentals to applications. * Includes basic information on the preparation through to the characterization of nanoparticles from various viewpoints * Includes information on nanostructures, which play an important role in practical applications.

**Handbook of Magnetic Materials**

Functional materials have assumed a very prominent position in several high-tech areas. Such materials are not being classified on the basis of their origin, nature of bonding or processing techniques but are classified on the basis of the functions they can perform. This is a significant departure from the earlier schemes in which materials were described as metals, alloys, ceramics, polymers, glass materials etc.
Several new processing techniques have also evolved in the recent past. Because of the diversity of materials and their functions it has become extremely difficult to obtain information from single source. Functional Materials: Preparation, Processing and Applications provides a comprehensive review of the latest developments. Serves as a ready reference for Chemistry, Physics and Materials Science researchers by covering a wide range of functional materials in one book. Aids in the design of new materials by emphasizing structure or microstructure – property correlation. Covers the processing of functional materials in detail, which helps in conceptualizing the applications of them.

**Sustainable Materials and Green Processing for Energy Conversion**

"This book on advanced functional textiles and polymers will offer a comprehensive view of cutting-edge research in newly discovered areas such as flame retardant textiles, antimicrobial textiles, insect repellent textiles, aroma textiles, medical-textiles, smart textiles, and nano-textiles etc. The second part the book provides innovative fabrication strategies, unique methodologies and overview of latest novel agents employed in the research and development of functional polymers"--

**Vanadium**

The Springer Handbook of Nanomaterials covers the description of materials which have dimension on the "nanoscale". The description of the nanomaterials in this Handbook follows the thorough but concise explanation of the synergy of structure, properties, processing and applications of the given material. The Handbook mainly describes materials in their solid phase; exceptions might be e.g. small sized liquid aerosols or gas bubbles in liquids. The materials are organized by their dimensionality. Zero dimensional structures collect clusters, nanoparticles and quantum dots, one dimensional are nanowires and nanotubes, while two dimensional are represented by thin films and surfaces. The chapters in these larger topics are written on a specific materials and dimensionality combination, e.g. ceramic nanowires. Chapters are authored by well-established and well-known scientists of the particular field. They have measurable part of publications and an important role in establishing new knowledge of the particular field.

**Nuclear Magnetic Resonance**

This book looks at the synthesis of polyaniline by different methods, under different conditions, for various applications, and presents studies of its properties by a wide range of the modern physic-chemical methods. The book provides a comprehensive analysis of experimental results from the point of view of the correlations in the triad synthesis conditions–structure–physico–chemical properties. It combines the results of experimental investigations and original methodology of the description of physical–chemical and electrochemical phenomena at interface surfaces, showing an influence of such phenomena on the applied aspects of the polyaniline and nanocomposites on its basis applications.

**Handbook of Smart Photocatalytic Materials**

**Advanced Functional Materials**

Energy is a key world issue in the context of climate change and increasing population, 'calling for alternative fuels, better energy storage, and energy-saving devices. This books reviews the principles and applications of metals and metal oxides for energy, with focus on batteries, electrodes, nanomaterials, electronics, supercapacitors, biotuels and sensors.

**Sulfur-Containing Polymers**

This book is the first comprehensive collection of electronic aspects of different kinds of elastomer composites, including combinations of synthetic, natural and thermoplastic elastomers with different conducting fillers like metal nanoparticles, carbon nanotubes, or graphenes, and many more. It covers elastomer composites, which are useful in electronic applications, including chemical and physical as well as material science aspects. The presented elastomer composites have great potential for solving emerging new material application requirements, for example as flexible and wearable electronics. The book is structured and organized by the rubber/elastomer type: each chapter describes a different elastomer matrix and its composites. While introducing to important fundamentals, it is application-oriented, discussing the current issues and challenges in the field of elastomer composites. This book will thus appeal to researchers and scientists, to engineers and technologists, but also to graduate students, working on elastomer composites, or on electronics engineering with the composites, providing the readers with a sound introduction to the field and solutions to both fundamental and applied problems.

**Advanced Functional Textiles and Polymers**

A comprehensive review of ion beam application in modern materials research is provided, including the basics of ion beam physics and technology. The physics of ion-solid interactions for ion implantation, ion beam synthesis, sputtering and nano-patterning is treated in detail. Its applications in materials research, development and analysis, developments of special techniques and interaction mechanisms of
ion beams with solid state matter result in the optimization of new material properties, which are discussed thoroughly. Solid-state properties optimization for functional materials such as doped semiconductors and metal layers for nano-electronics, metal alloys, and nano-patterned surfaces is demonstrated. The ion beam is an important tool for both materials processing and analysis. Researchers engaged in solid-state physics and materials research, engineers and technologists in the field of modern functional materials will welcome this text.

**Advanced Functional Materials**

An up-to-date view of the various detector/emitter materials systems currently in use or being actively researched. The book is aimed at newcomers and those already working in the IR industry. It provides both an introductory text and a valuable overview of the entire field.

**Aerospace Materials and Material Technologies**

"The book covers in-depth the various polymers that are used for sensors and actuators from the view of organic chemistry. The author has researched both scientific papers and patents to include all the recent discoveries and applications"--

**Flexible and Stretchable Electronic Composites**

Vanadium: Extraction, Manufacturing and Applications offers systematic coverage of the state-of-the-art in research and development of vanadium. Five chapters cover the basic background of vanadium, including extraction, applications, and the development of vanadium in industry and manufacturing, with a focus on industrial Panzhihua in China, which has one of the largest reserves of vanadium in the world. Based on the author’s 30+ years of experience in vanadium-based materials, including in industrial development, this book provides a solution for understanding the nature, sourcing, manufacture, and uses of vanadium in high-tech industry. Vanadium is critical to high-tech industry, and is used as a catalyst and as a functional material. It has applications including in high-stress alloys, batteries and supercapacitors, and catalysts. Research on vanadium has accelerated rapidly in scope and depth in recent years. Covers the different vanadium extraction processes Describes the configuration of industry relating to vanadium, focusing on products and processes Details vanadium applications in technology and in relation to particular product categories Considers the case of vanadium resource shortages, and the industry response Provides the necessary background to the theory, practice, technology, and manufacture of vanadium in contemporary industry

**Nano Design for Smart Gels**

Vanadium: Extraction, Manufacturing and Applications offers systematic coverage of the state-of-the-art in research and development of vanadium. Five chapters cover the basic background of vanadium, including extraction, applications, and the development of vanadium in industry and manufacturing, with a focus on industrial Panzhihua in China, which has one of the largest reserves of vanadium in the world. Based on the author’s 30+ years of experience in vanadium-based materials, including in industrial development, this book provides a solution for understanding the nature, sourcing, manufacture, and uses of vanadium in high-tech industry. Vanadium is critical to high-tech industry, and is used as a catalyst and as a functional material. It has applications including in high-stress alloys, batteries and supercapacitors, and catalysts. Research on vanadium has accelerated rapidly in scope and depth in recent years. Covers the different vanadium extraction processes Describes the configuration of industry relating to vanadium, focusing on products and processes Details vanadium applications in technology and in relation to particular product categories Considers the case of vanadium resource shortages, and the industry response Provides the necessary background to the theory, practice, technology, and manufacture of vanadium in contemporary industry

**Radiation Technology for Advanced Materials**

Nano Design for Smart Gels addresses the formation and application of technological gels and how nanostructural prospects are fundamental to gelling. Topics focus on the classification of gels based on small molecules and polymer gellers, biogels, stimulation conditions, topological, thermodynamic and kinetic aspects and characterization techniques. The book outlines structure and characterization concepts in order to provide pragmatic tools for the design and tailoring of new functional gel architectures. It provides an important source for readers and researchers who are currently or may soon be in research with gels, presenting an overview of fundamental topics. Highlights the building-blocks that make up the main functional groups that result in gelator compounds Provides an accessible source to the most common responses of gels, classified in their functional groups Outlines major characterization techniques, showing how they can be combined

**Lignocellulosics**

A must-have resource to the booming field of sulfur-containing polymers Sulfur-Containing Polymers is a state-of-the-art text that offers a synthesis of the various sulfur-containing polymers from low-cost sulfur resources such as elemental sulfur, carbon disulfide (CS2), carbonyl sulfide (COS) and mercaptan. With contributions from noted experts on the topic, the book presents an in-depth understanding of the mechanisms related to the synthesis of sulfur-containing polymers. The book also includes a review of the various types of sulfur-containing polymers, such as: poly(thioester)s, poly(thioether)s and poly(thiocarbonate)s and poly(thiourethane)s with linear or hyperbranched (dendrimer) architectures. The expert authors provide the fundamentals on the structure-property relationship and applications of sulfur-containing polymers. Designed to be beneficial for both research and application-oriented chemists and engineers, the book contains the most recent research and developments of sulfur-containing polymers. This important book: Offers the first comprehensive handbook on the topic Contains state-of-the-art research on synthesis of sulfur containing polymers from low-cost sulfur-containing compounds Examines the synthesis, mechanism, structure properties, and applications of various types of sulfur-containing polymers. Includes contributions from well-known experts Written for polymer chemists, materials scientists, chemists in industry, biochemists, and chemical engineers, Sulfur-Containing Polymers offers a groundbreaking text to the field with inforamtion on the most recent research.

**Functional Materials**

Now in its 43rd volume, the Specialist Periodical Report in Nuclear Magnetic Resonance presents comprehensive and critical reviews of the recent literature, providing the reader with an informed summary of the field from invited authors. Several chapters in this volume are
devoted to biochemistry, focussing on carbohydrates, lipids, and proteins and nucleic acids; Malcolm Prior also presents a chapter
examining the recent literature of NMR in living systems and Cynthia Jameson reviews the theoretical and physical aspects of nuclear
shielding, while Jaroslaw Jazwinski examines the theoretical aspects of spin-spin couplings. The lead volume editor, Krystyna Kamienska-
Trela, presents a chapter on the applications of spin-spin couplings. Anyone wishing to update themselves on the recent and hottest
developments in NMR will benefit from this volume, which deserves a place in any library or NMR facility. Purchasers of the print edition
can register for free access to the electronic edition by returning the enclosed registration card.

**Handbook of Chitin and Chitosan**

Polymer-based advanced functional materials are one of most sought after products of this global high performance material demand as
polymer-based materials guarantee both processing ease and mechanical flexibilities. This volume provides a comprehensive and updated
review of major innovations in the field of polymer-based advanced functional materials which focuses on constructive knowledge on
advanced multifunctional materials and their resultant techno-commercial applications. The contents aim at restricting the coverage to
energy and environment related applications as the said two are the most emerging application domains of polymer-based advanced
functional materials. It highlights the cutting-edge and recent research findings of polymer based advanced functional materials in energy
and environment sectors wherein each chapter focuses on a specific energy and environment related application of polymer-based advanced
functional materials, their preparation technique, nature enhancement achieved and allied factors. This volume would be of great interest to
researchers, academicians and professionals, involved in polymers, chemistry, energy and environmental research, and other allied
domains.

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