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Advanced Functional Materials

This book was written by authors in the field of preparation of advanced functional materials and their wide-ranging applications. The topics in the book include: preparation of several advanced functional materials, and their applications in sensors, health, concrete, textile, glasses, and pharmacy. In this book, the authors focused on recent studies, applications, and new technological developments in fundamental properties of advanced functional materials.

Advanced Functional Materials and Devices

This book presents the select proceedings of the International Conference on Advanced Functional Materials and Devices (AFMD 2021). It highlights the advancements in area of functional materials which includes electronic, magnetic, optical, adaptive and dielectric materials that are required to develop new functionalities with better performance in this new era of technology. The topics covered include materials for energy harvesting, biomedical applications, environmental monitoring, photonics and optoelectronic devices, strategic applications and high energy physics. This book will be a useful reference for beginners, researchers, academicians and professionals working in the area of material science and its allied fields.

Functional Materials and Application II

The 3rd International Conference on Advanced Functional Materials (ICAFM, San Francisco, California, USA) was a platform for academics, researchers, and practical engineers from around the world to present and disseminate their research outcome, to exchange innovative ideas and information on many branches of materials science: applied materials chemistry and physics with its functions, crystal growth, solid state sciences, solid state electronics, coatings and surface engineering, solar cells development, thin films, nanoscience, nanotechnology, as well as materials processing technologies. We hope this book will be useful for many specialists from the area of materials science.

Advanced Functional Materials

With recent developments in the polymer, ceramic, sensor, and fuel cell technology, a range of novel materials have been manufactured for advanced, compact, and electronic industry. Polymers, silicon, energy materials have received much attention in recent years. "Advanced Functional Materials" gives the most recent research results on polymer, fine ceramics, sensor, and green fuel cells. The content of this book, mainly based on the authors' recent research results, covers a broad spectrum including: the advanced inorganic-organic-hybrid polymeric materials, high functional sensor, and microbial fuel cells. The book is suitable for the researchers working in the areas of polymer, nanotechnology, ceramic engineering, engineering thermoplastic, energy and power engineering, chemical engineering and materials, etc. Hee-Gweon Woo is a professor at the Department of Chemistry, Chonnam National University, the Republic of Korea. Hong Li is a professor at the Institute of Polymer Chemistry, Nankai University, China.

Advanced Functional Materials

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 antimicrobial and biocompatible layer formation. This volume in the Advanced Materials Book Series includes twelve chapters divided into two main areas: Part 1: Functional Metal Oxides: Architecture, Design and Applications and Part 2: Multifunctional Hybrid Materials: Fundamentals and Frontiers*

Advanced Functional Materials

This proceedings volume gathers selected papers presented at the Chinese Materials Conference 2017 (CMC2017), held in Yinchuan City, Ningxia, China, on July 06-12, 2017. This book covers a wide range of metamaterials and multifunctional composites, multiferroic materials, amorphous and high-entropy alloys, advanced glass materials and devices, advanced optoelectronic and microelectronic materials, biomaterials, deformation behavior and flow units in metastable materials, advanced fibers and nano-composites, polymer materials, and nanoporous metal materials. The Chinese Materials Conference (CMC) is the most important serial conference of the Chinese Materials Research Society (C-MRS) and has been held each year since the early 1990s. The 2017 installment included 37 Symposia covering four fields: Advances in energy and environmental materials; High performance structural materials; Fundamental research on materials; and Advanced functional materials. More than 5500 participants attended the congress, and the organizers received more than 700 technical papers. Based on the recommendations of symposium organizers and after peer reviewing, 490 papers have been included in the present proceedings, which showcase the latest original research results in the field of materials, achieved by more than 300 research groups at various universities and research institutes.

Advanced Functional Materials

This book deals with functional materials that are in the frontiers of current materials science and technology research, development and manufacture. The first of its kind, it deals with three classes of materials, (1) magnetic semiconductors, (2) multiferroics, and (3) graphene. Because of the wide popularity of these materials there is a strong need for a book about these materials for graduate students, new researchers in science and technology, as well as experienced scientists and technologists, technology based companies and government institutes for science and technology. The book will provide this broad audience with both theoretical and experimental understanding to help in technological advances in the development of devices and related new technologies based on these very interesting and novel materials. Covers both the theoretical and experimental aspects of advanced functional materials, which are important for use in a number of rapidly developing novel technological devices. Includes excellent coverage of three of the leading advanced functional materials. Edited by a leading expert at the forefront of advanced functional materials research.

Machine Learning for Advanced Functional Materials

This book presents recent advancements of machine learning methods and their applications in material science and nanotechnologies. It provides an introduction to the field and for those who wish to explore machine learning in modeling as well as conduct data analyses of material characteristics. The book discusses ways to enhance the material's electrical and mechanical properties based on available regression methods for supervised learning and optimization of material attributes. In summary, the growing interest among academics and professionals in the field of machine learning methods in functional nanomaterials such as sensors, solar cells, and photocatalysis is the driving force behind this book. This is a comprehensive scientific reference book on machine learning for advanced functional materials and provides an in-depth examination of recent achievements in material science by focusing on topical issues using machine learning methods.

Mechanics of Advanced Functional Materials

Mechanics of Advanced Functional Materials emphasizes the coupling effect between the electric and mechanical field in the piezoelectric, ferroelectric and other functional materials. It also discusses the size effect on the ferroelectric domain instability and phase transition behaviors using the continuum micro-structural evolution models. Functional materials usually have a very wide application in engineering due to their unique thermal, electric, magnetic, optoelectronic, etc., functions. Almost all the applications demand that the material should have reasonable stiffness, strength, fracture toughness and the other mechanical properties. Furthermore, usually the stress and strain fields on the functional materials and devices have some important coupling effect on the functionality of the materials. Much progress has been made concerning the coupling electric and mechanical behaviors such as the coupled electric and stress field distribution in piezoelectric solids, ferroelectric domain patterns in ferroelectrics, fracture and failure properties under coupled electric and stress field, etc. The book is intended for researchers and postgraduate students in the fields of mechanics, materials sciences and applied physics who are interested to work on the interdisciplinary mathematical modeling of the functional materials. Prof. Biao Wang is the Dean of School of Physics and Engineering of the Sun Yat-sen University, China.

Special Issue of Symposium II Advanced Functional Materials: From Synthesis to Application

This book can have variety of readers, like graduate students and scientists/researcher, working on materials science and engineering.

Advanced Functional Materials: Properties and Applications

The book gives an insight into the latest research going on worldwide in the area of functional materials that specifically utilized for the energy harvesting, storage, and environmental monitoring. Since the technology is moving very fast day by day, it has become a need of hour to stay updated with recent advancements in materials which include electronic, magnetic, optical, adaptive, dielectric materials, etc., that are required to develop new functionalities with better performance that is beneficial for sustainable environment. The broad areas that are covered in the book include the knowledge of wide range of materials for energy harvesting, energy storage, and sensors for environmental monitoring. This book is a value additional reference for beginners, researchers, and academicians regarding the new functional materials for device applications. This book covers a wide range of topics: multifunctional materials, 2D materials, sensing materials, materials for environmental studies, DFT and solar simulation of materials, perovskite and double perovskite materials, materials for energy conversion and storage, smart materials, advanced functional materials, polymeric materials, composites, materials for sustainable development, nanomaterials, and thin films.

Advanced Functional Materials for Sustainable Environment

This book highlights the significance and usefulness of nanomaterials for the development of sensing devices and their real-life applications. The book also addresses various means of synthesizing functional materials, e.g., hydrothermal deposition process, electrospinning, Ostwald ripening, sputtering heterogeneous deposition, liquid-phase preparation, the vapor deposition approach, and aerosol flame synthesis. It presents an informative overview of the role of functional materials in the development of advanced sensor devices at the nanoscale and discusses the applications of functional materials in different forms prepared by diverse techniques in the field of optoelectronics and biomedical devices. Major features, such as type of advanced functional, fabrication methods, applications, tasks, benefits and restrictions, and saleable features, are presented in this book. Advanced functional materials for sensing have much wider applications and have an enormous impact on our environment.

Advanced Functional Materials for Optical and Hazardous Sensing

This three-volume set addresses a new knowledge of function materials, their processing, and their characterizations. \Functional and Smart Materials\

Functional Materials and Advanced Manufacturing

This collection of the scientific articles is based on the results of the 2nd International Conference on Advanced Functional Materials (ICAFM, August 4-6, 2017, Los Angeles, United States) and covers a wide range of last research results in area of functional materials - their properties and their possible practical application in the various branches of the modern production. We hope that presented collection will be useful and interesting for many engineers and researchers whose activity are related to materials science, processing and application of materials.

Functional Materials and Application

Functional materials are important materials for any technological needs and the forefront of materials research. Development of functional materials and their effective applications in the frontier fields of cross-multidisciplinary research programs is unique. This book presents an overview of different types of functional materials, including synthesis, characterization and application, and up-to-date treatment of functional materials, which are needed for structural, magnetic, polymeric, electromagnetic, etc. applications. New topics based on polymeric materials and spintronic materials are given for possible applications. The chapters of the book provide a key understanding of functional materials. It is suitable for undergraduates, graduates, and professionals, including engineers, scientists, researchers, technicians, and technology managers.

Structural, Electronic and Mechanical Properties of Advanced Functional Materials

Contributors of this collection have extensive experience at various field of development the materials and technology for advanced applications. This book is a result of collaboration between all contributing authors who agreed to share their research expertise as well as visions for the future materials development

Functional Materials

Collection of selected, peer reviewed papers from the 8th International Conference on Molecular Imprinting (MIP 2014), September 18-21, 2014, Zhenjiang, China. The 37 papers are grouped as follows: Chapter 1: Engineering Materials; Chapter 2: Biotechnologies and Biomedical Engineering

Advanced Functional Materials

Das erste Handbuch und gut zugängliche Referenzwerk zu diesem zunehmend wichtigen Thema erläutert in einem anwendungsorientierten Ansatz Synthese, Design, Charakterisierung und Simulation von Grenzflächen bei hybriden organisch-anorganischen Materialien.

Recent Highlights in Advanced Functional Materials and Biomedical Research

This volume is collected from papers submitted on the 4th International Conference on Smart Materials Technologies (4th ICSMT), held during 21-23 June 2019, Saint-Petersburg, Russia and on the 4th International Conference on Advanced Functional Materials (4th ICAFM) has been successfully held during August 2-5, 2019 in Salt Lake City, USA. The collected articles reflect both theoretical and experimental studies of materials properties for a wide range of their application.

Hybrid Organic-Inorganic Interfaces

The development of functional materials is at the heart of technological needs and the forefront of materials research. This book provides a comprehensive and up-to-date collection of peer reviewed reports on functional materials. The 76 papers are grouped as follows: Chapter 1: Metallic, Magnetic, Electric and Photoelectric Functional Materials; Chapter 2: Nano and Inorganic Functional Materials; Chapter 3: Organic and Polymer Functional Materials; Chapter 4: Thin Film, Membrane and Coating Materials; Chapter 5: Biological and Environment Functional Materials.

Functional Materials and Advanced Technologies

Showcases the highly beneficial features arising from the presence of main group elements in organic materials, for the development of more sophisticated, yet simple advanced functional materials Functional organic materials are already a huge area of academic and industrial interest for a host of electronic applications such as Organic Light-Emitting Diodes (OLEDs), Organic Photovoltaics (OPVs), Organic Field-Effect Transistors (OFETs), and more recently Organic Batteries. They are also relevant to a plethora of functional sensory applications. This book provides an in-depth overview of the expanding field of functional hybrid materials, highlighting the incredibly positive aspects of main group centers and strategies that are furthering the creation of better functional materials. Main Group Strategies towards Functional Hybrid Materials features contributions from top specialists in the field, discussing the molecular, supramolecular and polymeric materials and applications of boron, silicon, phosphorus, sulfur, and their higher homologues. Hypervalent materials based on the heavier main group elements are also covered. The structure of the book allows the reader to compare differences and similarities between related strategies for several groups of elements, and to draw crosslinks between different sections. The incorporation of main group elements into functional organic materials has emerged as an efficient strategy for tuning materials properties for a wide range of practical applications Covers molecular, supramolecular and polymeric materials featuring boron, silicon, phosphorus, sulfur, and their higher homologues Edited by internationally leading researchers in the field, with contributions from top specialists Main Group Strategies towards Functional Hybrid Materials is an essential reference for organo-main group chemists pursuing new advanced functional materials, and for researchers and graduate students working in the fields of organic materials, hybrid materials, main group chemistry, and polymer chemistry.

Current Research on Functional Materials

Collection of selected, peer reviewed papers from the Chinese Materials Congress 2014 (CMC 2014), July 4-7, 2014, Chengdu, China. The 127 papers are grouped as follows: Symposium E: Materials in Microelectronic and Optoelectronic Industry; Symposium G: Multiferroic Materials; Symposium H: Smart Materials; Symposium I: Vanadium-Titanium And Rare Earth Functional Materials; Symposium J: Biomedical Materials; Symposium K: High Performance And Functional Polymer and Composite Materials

Main Group Strategies towards Functional Hybrid Materials

The book presents the select proceedings of 2nd International Conference on Advanced Functional Materials and Devices (AFMD-2023). It covers the latest research in the area of functional materials. Various topics covered in this book include 2D materials, biomaterials, materials for environmental studies, DFT and solar simulation of materials, perovskite and double perovskite materials, luminescent materials, smart materials, materials for energy conversion and storage, smart materials, advanced functional materials, polymeric materials, composites, liquid crystals, materials for sustainable development, nanomaterials and thin films, smart devices and quantum dots synthesis technique, and characterization tools with application in smart devices. This book is for researchers and professionals working on various functional materials for device applications.

Advanced Functional Materials

This book presents state-of-the-art coverage of synthesis of advanced functional materials. Unconventional synthetic routes play an important role in the synthesis of advanced materials as many new materials are metastable and cannot be synthesized by conventional methods. This book presents various synthesis methods such as conventional solid-state method, combustion method, a range of soft chemical methods, template synthesis, molecular precursor method, microwave synthesis, sono-chemical method and high-pressure synthesis. It provides a comprehensive overview of synthesis methods and covers a variety of materials, including ceramics, films, glass, carbon-based, and metallic materials. Many techniques for processing and surface functionalization are also discussed. Several engineering aspects of materials synthesis are also included. The contents of this book are useful for researchers and professionals working in the areas of materials and chemistry.

Recent Advances in Functional Materials and Devices

"Functional Materials textbook is not simply a review of the vast body of literature of the recent years, as it holds the focus upon various aspects of application. Moreover, it selects only a few topics in favor of a solid and thorough treatment of the relevant aspects. This book comes in a good time, when a large body of academic literature has been accumulated and is waiting for a critical inspection in the light of the real demands of application." Professor Gerhard Wegner, Max-Planck Institute for Polymer Research, Mainz, Germany The chapters cover three important fields in the development of functional materials: energy, environment, and biomedical applications. These topics are explained and discussed from both an experimental and a theoretical perspective. Functional organic and inorganic materials are at the center of most technological breakthroughs. Therefore, the understanding of material properties is fundamental to the development of novel functionalities and applications.

Handbook on Synthesis Strategies for Advanced 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

Advanced Functional Materials Based on Metal-organic Frameworks

The rapid advancement of the modern industry necessitates a particularly crucial focus on the development of clean energy technologies. At present, energy storage systems mainly consist of alkali metal ion batteries, fuel cells, electrolytic capacitors, dielectric capacitors and supercapacitors. Organic functional materials are playing an indispensable role in this field. The key to advancing sustainable energy lies in the further understanding and developing of organic functional materials. This book can serve as a valuable reference for advanced graduate students and active researchers by providing a fundamental understanding of organic functional materials. Scientists and engineers who wish to diversify their research into clean energy will find this book immensely beneficial. The selected topics in this book offer a global perspective on the current state of this field. Evolving methodologies and techniques constantly provide new dimensions every year as the general interest in clean energy continues to grow.

Functional Materials

In this book we explore new approaches to understanding the physical and chemical properties of emergent complex functional materials, revealing a close relationship between their structures and properties at the molecular level. The primary focus of this book is on the ability to synthesize materials with a controlled chemical composition, a crystallographic structure, and a well-defined morphology. Special attention is also given to the interplay of theory, simulation and experimental results, in order to interconnect theoretical knowledge and experimental approaches, which can reveal new scientific and technological directions in several fields, expanding the versatility to yield a variety of new complex materials with desirable applications and functions. Some of the challenges and opportunities in this field are also discussed, targeting the development of new emergent complex functional materials with tailored properties to solve problems related to renewable energy, health, and environmental sustainability. A more fundamental understanding of the physical and chemical properties of new emergent complex functional materials is essential to achieving more substantial progress in a number of technological fields. With this goal in mind, the editors invited acknowledged specialists to contribute chapters covering a broad range of disciplines.

Functional Materials

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 nanomaterial

Advanced Structural and Functional Materials

Functional Materials for the Oil and Gas Industry: Characterization and Applications discusses the latest techniques in characterization and applications of functional materials in the oil and gas industry. It provides an expert review of recent developments in a variety of materials, such as ceramics, composites, and alloys, and covers all major aspects relevant to the industry, including asset management (corrosion), operation (pipeline engineering), energy management, and applications in extreme environments. This book: Discusses modern characterization techniques, such as in situ TEM, SAXS, SANS, X-ray, and neutron tomography Covers conventional and advanced nondestructive techniques (NDTs), such as ultrasonic testing and radiography for asset integrity checking in oil and gas sectors Describes advanced properties of a variety of functional materials and their applications to the oil and gas field Explains self-cleaning coating technologies and their applications and materials for renewable energy sources Details advances in synthesis methods for functional materials Features industrial aspects of afunctional materials application in each chapter Written for an interdisciplinary audience of industrial practitioners, academics, and researchers in petroleum, materials, chemical, and related disciplines of engineering, this work offers significant insight into the state-of-the-art in the development and characterization of advanced functional materials.

Organic Functional Materials for Clean Energy

Selected peer-reviewed full text papers from the 5th International Conference on Functional Materials Science (5th ICFMS 2020) Selected, peer-reviewed papers from the 5th International Conference on Functional Materials Science (5th ICFMS 2020), November 11-12, 2020, Bali, Indonesia

Recent Advances in Complex Functional Materials

Handbook of Research on Functional Materials: Principles, Capabilities and Limitations covers a broad range of modern materials and provides industry professionals and researchers in polymer science and technology with a single, comprehensive book summarizing all aspects involved in the modern materials production chain. The book focuses on industr

Functional Materials

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 antimicrobial and biocompatible layer formation. This volume in the Advanced Materials Book Series includes twelve chapters divided into two main areas: Part 1: Functional Metal Oxides: Architecture, Design and Applications and Part 2: Multifunctional Hybrid Materials: Fundamentals and Frontiers*

Functional Materials for the Oil and Gas Industry

This book describes the latest research on nanopolysaccharides in the development of functional materials, from their preparation, properties and functional modifications to the architecture of diverse functional materials. Polysaccharide-based nanoparticles, including nanocellulose, nanochitin, and nanostarch have attracted interest in the field of nanoscience, nanotechnology, and materials science that encompasses various industrial sectors, such as biomedicine, catalyst, coating, energy, optical materials, environmental materials, construction materials, and antibacterial materials. This book establishes a fundamental framework, highlighting the architecture strategies of typical functional systems based on nanopolysaccharides and integrated analysis of their significant influence and properties to various functional behaviors of materials, to help readers to fully understand the fundamental features of nanopolysaccharides and functional materials. Addressing the potential for practical applications, the book also covers the related industrial interests and reports on highly valued products from nanopolysaccharides, providing ideas for future studies in the area. Intended both for academics and professionals who are interested in nanopolysaccharides, it is also a valuable resource for postgraduate students, researchers, and engineers involved in R&D of natural polymers, nanotechnology, and functional materials.

Selected Properties of Functional Materials

Exploring Surfaces and Buried Interfaces of Functional Materials by Advanced X-ray and Neutron Techniques

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