Characterization And Applications Of Activated Carbon

Activated Carbon Fiber and Textiles provides systematic coverage of the fundamentals, properties, and current and emerging applications of carbon fiber textiles in a single volume, providing industry professionals and academics working in the field with a broader understanding of these materials. Part I discusses carbon fiber principles and production, including precursors and pyrolysis, carbon fiber spinning, and carbonization and activation. Part II provides more detailed analysis of the key properties of carbon fiber textiles, including their thermal, acoustic, electrical, adsorption, and mechanical behaviors. The final section covers applications of carbon fiber such as filtration, energy protection, and energy and gas storage. Features input from an editor who is an expert in his field: Professor Jonathan Chen has a wealth of experience in the area of activated carbon fiber materials Provides systematic and comprehensive coverage of the key aspects of activated carbon fiber textiles, from their principles, processing, and properties to their industrial applications Offers up-to-date coverage of new technology for the fiber and textiles industries Covers applications such as filtration, energy protection, and energy and gas storage

Agricultural and food industry waste materials have been an important feedstock for activated carbon production for many years. In the development of cleaner energy production and utilization processes, new advanced carbon materials with enhanced properties have been studied. Techniques to tailor pore structure and surface chemistry can produce better carbon materials for energy storage, electrode materials, and selective adsorption of pollutants. This book surveys available waste materials and processes for carbon production and then reviews the recent developments in the use of carbon materials for energy storage, as catalyst supports, and for environmental applications.

This book attempts to cover various issues of water quality in the fields of Hydroecology and Hydrobiology and present various Water Treatment Technologies. Sustainable choices of water use that prevent water quality problems aiming at the protection of available water resources and the enhancement of the aquatic ecosystems should be our main target.

Recent years have seen an expansion in speciality uses of activated carbons including medicine, filtration, and the purification of liquids and gaseous media. Much of current research and information surrounding the nature and use of activated carbon is scattered throughout various literature, which has created the need for an up-to-date comprehensive and integrated review reference. In this book, special attention is paid to porosities in all forms of carbon, and to the modern-day materials which use activated carbons - including fibres, clothes, felts and monoliths. In addition, the use of activated carbon in its granular and powder forms to facilitate usage in liquid and gaseous media is explored. Activated Carbon will make essential reading for Material Scientists, Chemists and Engineers in academia and industry. Characterization of porosity The surface chemistry of the carbons Methods of activation and mechanisms of adsorptio Computer modelling of structure and porosity within carbons Modern instrumental analytical methods

Production, Characterization, and Applications

Biomass Chars: Elaboration, Characterization and Applications

Super Activated Carbon Containing Substitutional Boron

Production, Characterization, and Applications of Activated Carbon

Activated Carbon

Characterization and Applications

This book discusses the recent advances in the wastes recycling technologies to provide low-cost and alternative ways for nanomaterials production. It shows how carbon nanomaterials can be synthesized from different waste sources such as banana fibers, argan (Argania spinosa) seed shells, corn grains, camellia oleifera shell, sugar cane bagasse, oil palm (empty fruit bunches and leaves) and palm kernel shells. Several nanostructured metal oxides (MnO2, Co3O4,...) can be synthesized via recycling of spent batteries. The recovered nanomaterials can be applied in many applications including: Energy (supercapacitors, solar cells, etc.) water treatments (heavy metal ions and dyes removal) and other applications. Spent battery and agriculture waste are rich precursors for metals and carbon, respectively. The book also explores the various recycling techniques, agriculture waste recycling, batteries recycling, and different applications of the recycled materials.

This thesis investigates the production of activated carbon, an environmentally friendly adsorbent which is used in many industries. Activated carbon can be derived from many different sources and produced in varying production processes. The raw materials used, activation process, and process parameters determine the physical properties and performance characteristics of the resulting carbon. Modifying these activation properties determines the porosity and pore volume distribution in the carbon. In preparation for commercial production, detailed mass balances are needed to quantify yield, quantify the masses of waste streams, understand the propensity to recycle the KOH, and to provide a benchmark for further optimization. A mass balance on the reaction of phosphoric acid and KOH with carbon is provided. Additionally, analyzing carbons can be expensive and time consuming, making it important to identify physical properties which indicate that a carbon may have favorable performance characteristics. The following paper proposes three ways of screening carbons: observing the mass loss in the chemical activation process, measuring the density of the carbon, and testing the methane uptake of the carbon in a rapid uptake fixture. Carbons made from different precursors, reacted with different activating agents, and heated at different process temperatures for different process hold times were analyzed.

Geopolymers and zeolites as eco-friendly materials can participate in cutting-edge research and applications due to their tailored properties, including superabsorbent capacity, heavy metals encapsulation, flame retardancy, mechanical performance, electrokinetic behaviour, corrosion resistance, and thermal properties. This book joins activities and knowledge of researchers from multiple fields to present a comprehensive overview of the advances in synthesis and characterization of geopolymers and zeolites, including base chemistry concepts, nanoscale characterization, and applications in top-level industry.

Synthesis, Technology and Applications of Carbon Nanomaterials explores the chemical properties of different classes of carbon nanomaterials and their major applications. As carbon nanomaterials are used for a variety of applications due to their versatile properties and characteristics, this book discusses recent advances in synthesis methods, characterization, and applications of 0D -3D dimensional carbon nanomaterials. It is an essential resource for readers focusing on carbon nanomaterials research. Explores the chemical properties of different classes of carbon nanomaterials and their major applications

Discusses recent advances in synthesis methods, characterization, and applications of 0D -3D dimensional carbon nanomaterials

Synthesis, Characterization and Applications in Hydrogen Storage

Fundamentals, Preparation, Characterization and Applications

Biomass Chars: Elaboration, Characterization and Applications II

Preparation, Structural and Morphological Property and Application

Carbon Nanomaterials as Adsorbents for Environmental and Biological Applications

Carbon

Production, Characterization, and Applications of Activated Carbon

This book presents a summary of the current use of carbon nanomaterials for water treatment, drug delivery, systems and nanosensors. The first chapter elucidates the adsorption process phenomenon. Also, the properties of different carbon nanomaterials for adsorption applications are covered. The third chapter presents the kinetic and equilibrium models of adsorption, processing of experimental data and adsorption process peculiarities. Environmental and biological applications of carbon nanomaterials are listed in the last chapter. This book is written from an application-oriented perspective and is useful for all those interested in nanoadsorbents.

The present book discusses the principal lignocellulosic precursors used in the elaboration of activated carbons in different countries such as Asia, America, Europe and Africa; the different methods and experimental conditions employed in the synthesis of activated carbons, including one analysis of the principal stages of the preparation such as carbonization and activation (i.e., chemical or physical activation). Also, the recent and more specialized techniques used in the characterization of activated carbons are discussed in this book. For example, the techniques employed to determine textural parameters (mercury porosimetry and gas adsorption isotherms at 77 K) and different spectroscopies to determine chemical functionality (Raman, FT-IR, etc.) and other X-Ray techniques. Additionally, an overview of the application of activated carbons obtained from lignocellulosic precursors for wastewater treatment. Specifically, the analysis and discussion are focused on the advantages and capabilities of activated carbons for the removal of relevant toxic compounds and pollutants from water such as heavy metals, dyes, phenol, etc. Finally, the use of pyrolysis method for the valorization of two Mexican typical agricultural wastes (orange peel and pecan nut shell) for energy and carbon production is considered in this book.

Encompassing high priority research areas such as bioenergy production, global warming mitigation, and sustainable agriculture, biochar has received increased worldwide interest in the past decade.Biochar: Production, Characterization, and Applications covers the fundamentals of biochar including its concept, production technology, and characteriza

Calorimetry

Adsorption by Carbons

The Black, the Gray and the Transparent

Advances in Geopolymer-Zeolite Composites

Activated Carbon Surfaces in Environmental Remediation

Handbook Of Porous Materials: Synthesis, Properties, Modeling And Key Applications (In 4 Volumes)

This book is a printed edition of the Special Issue "Biomass Chars: Elaboration, Characterization and Applications" that was published in Energies

Discover foundational and cutting-edge concepts in the supercapacitor materials industry Dramatic population growth and the development of lightweight portable electronic devices have accelerated the demand for faster and more sustainable energy storage systems. Supercapacitors promise to revolutionize the field due to their high energy and power density, long cycle life, fast rate of charge-discharge, and excellent safety record. In Handbook of Supercapacitor Materials: Synthesis, Characterization, and Applications, a distinguished team of researchers delivers a comprehensive review of nature-inspired, organic, inorg in supercapacitor technology. The book explores aspects of synthesis methods, properties, foundational concepts, and the mechanisms of supercapacitor electrode materials. The distinguished editors also provide resources that focus on supercapacitor performance utilizing electrical double layer electrodes and pseudocapacitor electrodes. State-of-the-art research is discussed in detail and will be extraordinary useful for graduate students, faculty, engineers, and scientists in solid-state chemistry, energy science, and materials science departments. Readers will also find: Overviews of mussel-inspired materials for electrocl active materials for supercapacitors, and self-healing supercapacitors Practical discussions of polysaccharide-derived materials for supercapacitors, bio-derived carbon-based materials for supercapacitors, and metal oxides A thorough introduction to metal chalcogenides and metal hydroxides for supercapacitors An examination of template strategy direction towards conducting polymer for supercapacitors A treatment of the morphology paradigm of conducting polymers Perfect for materials scientists, electrochemists, engineers in power technology, Handbook of Supercapacitor Materials: Synthesis, Characterization, and A resource for professionals working in the electrotechnical and automobile industries.

This volume presents contributions by a galaxy of eminent scientists and technologists from the world over in broad spectrum of areas in materials science, providing a global perspective on complex issues of current concern and the direction of research in these areas.

High surface area, a microporous structure, and a high degree of surface reactivity make activated carbons versatile adsorbents, particularly effective in the adsorption of organic and inorganic pollutants from aqueous solutions. Activated Carbon Adsorption introduces the parameters and mechanisms involved in the activated carbon adsorption

Synthesis and Characterization

Twenty-Seventh Symposium on Biotechnology for Fuels and Chemicals

Characterization Techniques and Applications in the Wastewater Treatment

Hybrid Phosphor Materials

Synthesis, Characterization and Applications

Handbook of Supercapacitor Materials

Porosity in carbons often means different things to different people depending largely on the different applications of the various carbon materials. On the one hand, users involved in gas purification or respiratory protection are concerned primarily with microporosity, and at the other extreme, the user of carbon in the form of metallurgical coke is concerned with macroporosity because of its influence on the mechanical properties of the coke. Between these extremes there is a range of applications which rely on different aspects of the nature of the porous structure and the characterization required reflects the particular application in mind. This characterization of a wide diversity of porous structures presents some problems. However recent developments have produced some solutions, for example computerized image analysis has facilitated the measurement of pore shape and size. The eleven chapters in this book present an analysis of the current methods of characterization and the role of various aspects of carbon porosity in some representative and diverse applications.

The unifying theme within this work is the production of porous activated carbon (AC) materials from different carbon-containing precursors for electrochemical supercapacitors (ES) applications. The activated carbon-based ES is an emerging storage technology that promises to play an important role in meeting the rising demands from the energy sector. Thus, it is necessary to study and produce various high-quality ACs by optimizing the micro/meso-porous architecture as electrodes and also study the effect of different electrolytes on the electrochemical behavior of the produced ACs. The produced ACs which are discussed in different sections in chapter 4 show specific surface area ranging from ~300 m2 g-1 to ~3000 m2 g-1, specific capacitances in the range of ~179 F g-1 to ~335 F g-1 and energy density in the range of ~15 Wh kg-1 to ~38 Wh kg-1 at a current density of 0.5 A g. Both symmetric and asymmetric devices also showed excellent long term stability and no capacitance loss after 10,000 charge discharge and the stable operating potential ranging from 1.2 V to 2 V depending on the electrolyte used. All devices kept the important property of supercapacitors which is a high power density even at low current densities. All the results presented above showed the great potential in the adoption of the synthesized activated carbon material for supercapacitor applications.

*Reactions with metals are ubiquitous in organic synthesis and, particularly in the last few years, a large repertoire of methods for the activation of metals and for their use in organic synthesis has been developed. In Active Metals, topics ranging from morphology of metal clusters and nanometallurgy to organometallic chemistry, catalysis and the use of activated metals in natural product synthesis are authoritatively discussed by leading experts in the field. Active Metals will allow you to fully benefit from the recent advances in the field by giving: * Detailed experimental procedures * Guidance on manipulation of active metals under inert atmosphere * Valuable information for planning syntheses * Extensive tables of typical conversions with yields * Critically selected, up-to-date references This handbook is a unique source of 'hands-on' information which will allow you to expand the scope of your research.*

This book reports the basics of hybrid phosphor materials, their synthesis routes and their special properties and characterization techniques. It gives the reader information about the natural origins and development of hybrid materials, which are developed by combining inorganic and organic species in one material interface-determined materials. The book provides a general classification of hybrid materials, wherein inorganic materials modified by organic moieties are distinguished from organic materials or matrices modified by inorganic constituents. It gives a focus to the functionalization of organic materials by inorganic additives. The application areas covered include optoelectronic field, sensor applications, biological and environmental applications.

Production, Characterization and Applications

Advances and Applications

Green Carbon Materials

Waste Recycling Technologies for Nanomaterials Manufacturing

Carbon-Based Metal Free Catalysts

Active Metals

Following in the lineage of Adsorption by Carbons (Bottani & Tascon, 2008), this work explores current research within contemporary novel carbon adsorbents. Both basic and applied aspects are discussed for this important class of materials. The first section of the book introduces physical adsorption and carbonaceous materials, and is followed by a section concerning the fundamentals of adsorption by carbons. This leads to development of a series of theoretical concepts that serve as an introduction to the following section in which adsorption is mainly envisaged as a tool to characterize the porous texture and surface chemistry of carbons. Particular attention is paid to novel nanocarbons, and the electrochemistry of adsorption by carbons is also addressed. Finally, several important technological applications of gas and liquid adsorption by carbons in areas such as environmental protection and energy storage constitute the last section of the book. Encompasses fundamental science of adsorption by carbons, in one location, supporting current R&D without extensive literature review Describes adsorption as it is currently applied to major novel types of carbon materials, including carbon gels, carbide-derived carbons, zeolite-templated carbvons, hydrothermal carbons, carbon nanohorns and graphene Specific discussion of fuel storage, environmental remediation and biomedical applications, of contemporary interest to many surface chemists and applications-focused researchers

All living things contain carbon in some form, as it is the primary component of macromolecules including proteins, lipids, nucleic acids (RNA and DNA), and carbohydrates. As a matter of fact, it is the backbone of all organic (chemistry) compounds forming different kinds of bonds. Carbon: The Black, the Gray and the Transparent is not a complete scientific history of the material, but a book that describes key discoveries about this old faithful element while encouraging broader perspectives and approaches to its research due to its vast applications. All allotropes of carbon are described in this book, along with their properties, uses, and methods of procurement or manufacturing. Black carbon is represented by coal, gray carbon is represented by graphite, and transparent carbon is represented by diamond.

Char and Carbon Materials Derived from Biomass: Production, Characterization and Applications provides an overview of biomass char production methods (pyrolysis, hydrothermal carbonization, etc.), along with the characterization techniques typically used (Scanning Electronic Microscopy, X-Ray Fluorescence, Nitrogen adsorption, etc.) In addition, the book includes a discussion of the various properties of biomass chars and their suitable recovery processes, concluding with a demonstration of applications. As biomass can be converted to energy, biofuels and bioproducts via thermochemical conversion processes, such as combustion, pyrolysis and gasification, this book is ideal for professionals in energy production and storage fields, as well as professionals in waste treatment, gas treatment, and more. Provides a discussion of sources of biomass feedstocks, such as agricultural, woody plants and food processing residue Discusses the various production processes of biomass chars, including pyrolysis and hydrothermal carbonization Explores various applications of biomass chars within different industries, including energy and agronomy

This book contains select proceedings of the International Conference on Smart Technologies for Energy, Environment, and Sustainable Development (ICSTEESD 2020). The book is broadly divided into the themes of energy, environment, and sustainable development; and discusses the significance and solicitations of intelligent technologies in the domain of energy and environmental systems engineering. Topics covered in this book include sustainable energy systems including renewable technologies, energy efficiency, techno-economics of energy system and policies, integrated energy system planning, environmental management, energy efficient buildings and communities, sustainable transportation, smart manufacturing processes, etc. The book will be a valuable reference for young researchers, professionals, and policy makers working in the areas of energy, environment and sustainable development.

Water Treatment and Reuse

Synthesis, Technology and Applications of Carbon Nanomaterials

Production, Characterization and Applications of Activated Carbon Produced from Cocoa Shell (Theobroma Cacao)

Porosity in Carbons

Char and Carbon Materials Derived from Biomass

Metal-free carbons have recently shown great efficiency in several catalytic processes, including oxidative dehydrogenation (ODH) of ethylbenzene and alkenes, hydrogen evolution, liquid Brnsted and Lewis acid catalysis and electrochemical reactions. The catalytic activities of carbon materials are intimately related to their defects, structures, and surface chemistry. In particular, nitrogen functionalized carbons present different surface functional groups, and they can be used as multifunctional catalysts, either through their electronic or nucleophilic properties, or their ability to form additional H bonds with substrates. This book provides an overview of the preparation, characterization and application of metal-free functionalized carbons, including carbon nanotubes, graphene, carbon nitride and covalent organic frameworks (COFs). It is ideal for researchers and industrialists working in catalysis, gas sensing and carbon dioxide storage.

Activated Carbon Surfaces in Environmental Remediation provides a comprehensive summary of the environmental applications of activated carbons. In order to understand the removal of contaminants and pollutants on activated carbons, the theoretical bases of adsorption phenomena are discussed. The effects of pore structure and surface chemistry are also addressed from both science and engineering perspectives. Each chapter provides examples of real applications with an emphasis on the role of the carbon surface in adsorption or reactive adsorption. The practical aspects addressed in this book cover the broad spectrum of applications from air and water cleaning and energy storage to warfare gas removal and biomedical applications. This book can serve as a handbook or reference book for graduate students, researchers and practitioners with an interest in filtration, water treatment, adsorbents and air cleaning, in addition to environmental policies and regulations. Addresses fundamental carbon science and how it relates to applications of carbon surfaces Describes the broad spectrum of activated carbon applications in environmental remediation Serves as a handbook or reference book for graduate students, researchers and practitioners in the field

Biomass can be converted to energy, biofuels, and bioproducts via thermochemical conversion processes, such as combustion, pyrolysis, and gasification. Combustion technology is most widely applied on an industrial scale. However, biomass gasification and pyrolysis processes are still in the research and development stage. The major products from these processes are syngas, bio-oil, and char (called also biochar for agronomic application). Among these products, biomass chars have received increasing attention for different applications, such as gasification, co-combustion, catalysts or adsorbents precursors, soil amendment, carbon fuel cells, and supercapacitors. This Special Issue provides an overview of biomass char production methods (pyrolysis, hydrothermal carbonization, etc.), characterization techniques (e.g., scanning electronic microscopy, X-ray fluorescence, nitrogen adsorption, Raman spectroscopy, nuclear magnetic resonance spectroscopy, X-ray photoelectron spectroscopy, and temperature programmed desorption and mass spectrometry), their properties, and their suitable recovery processes.

This four-volume handbook gives a state-of-the-art overview of porous materials, from synthesis and characterization and simulation all the way to manufacturing and industrial applications. The editors, coming from academia and industry, are known for their didactic skills as well as their technical expertise. Coordinating the efforts of 37 expert authors in 14 chapters, they construct the story of porous carbons, ceramics, zeolites and polymers from varied viewpoints: surface and colloidal science, materials science, chemical engineering, and energy engineering. Volumes 1 and 2 cover the fundamentals of preparation, characterisation, and simulation of porous materials. Working from the fundamentals all the way to the practicalities of industrial production processes, the subjects include hierarchical materials, in situ and operando characterisation using NMR, X-Ray scattering and tomography, state-of-the-art molecular simulations of adsorption and diffusion in crystalline nanoporous materials, as well as the emerging areas of bio-artificing and drug delivery. Volume 3 focuses on porous materials in industrial separation applications, including adsorption separation, membrane separation, and osmotic distillation. Finally, and highly relevant to tomorrow's energy challenges, Volume 4 explains the energy engineering aspects of applying porous materials in supercapacitors, fuel cells, batteries, electrolysers and sub-surface energy applications.The text contains many high-quality colourful illustrations and examples, as well as thousands of up-to-date references to peer-reviewed articles, reports and websites for further reading. This comprehensive and well-written handbook is a must-have reference for universities, research groups and companies working with porous materials.Related Link(s)

Ecological Water Quality

Preparation, Characterization and Applications of Multi - Functional Iron Oxides - Impregnated Activated Carbon Materials

Synthesis and Characterization of Activated Carbon Materials for Supercapacitor Applications

Thin Films: Preparation, Characterization, Applications

Synthesis, Characterization, and Applications

Engineered Biochar

Adsorption by Carbons covers the most significant aspects of adsorption by carbons, attempting to fill the existing gap between the fields of adsorption and carbonaceous materials. Both basic and applied aspects are presented. The first section of the book introduces physical adsorption and carbonaceous materials, and is followed by a section concerning the fundamentals of adsorption by carbons. This leads to development of a series of theoretical concepts that serve as an introduction to the following section in which adsorption is mainly envisaged as a tool to characterize the porous texture and surface chemistry of carbons. Particular attention is paid to some novel nanocarbons, and the electrochemistry of adsorption by carbons is also addressed. Finally, several important technological applications of gas and liquid adsorption by carbons in areas such as environmental protection and energy storage constitute the last section of the book. The first book to address the interplay between carbonaceous materials and adsorption Includes important environmental applications, such as the removal of volatile organic compounds from polluted atmospheres Covers both gas-solid and liquid-solid adsorption

Today, calorimetry is considered an art (although some consider it a tool) that studies the energy changes that occur during a change of state. This allows physicochemical analysis to study in detail the thermodynamic systems and to evaluate the different variables that establish the characteristics of the system itself. This book illustrates how the reader can use this technique in a wide spectrum of applications.

industry, and 22% were from government. A total of oral presentations (including Special Topic presentations) and 329 poster presentations were delivered. The high number of poster submissions required splitting the poster session into two evening sessions. (Conference details are posted at http://www.eere.energy.gov/biomass/biotech_symposium/.) Almost 35% of the attendees were international, showing the strong and building worldwide interest in this area. Nations represented included Australia, Austria, Belgium, Brazil, Canada, Central African Republic, China, Denmark, Finland, France, Gambia, Germany, Hungary, India, Indonesia, Italy, Japan, Mexico, The Netherlands, New Zealand, Portugal, South Africa, South Korea, Spain, Sweden, Thailand, Turkey, United Ki- dom, and Venezuela, as well as the United States. One of the focus areas for bioconversion of renewable resources into fuels is conversion of lignocellulose into sugars and the conversion of s- ars into fuels and other products. This focus is continuing to expand toward the more encompassing concept of the integrated multiproduct biorefinery--where the production of multiple fuel, chemical, and energy products occurs at one site using a combination of biochemical and ther- chemical conversion technologies. The biorefinery concept continues to grow as a unifying framework and vision, and the biorefinery theme f- tured prominently in many talks and presentations. However, another emerging theme was the importance of examining and optimizing the entire biorefining process rather than just its bioconversion-related elements.

This book systematically covers the fundamentals and applications of modified biochar. The 19 chapters are divided into 3 sections that provide a holistic overview for researchers from all related fields. Section 1 and 2 present the pyrolysis process, including the advantages and limitations of the physical, chemical, and biological modification methods and characterization of modified biochar. Section 3 highlights the wide spectrum of applications of modified biochar in fuel cells and batteries, remediation of organic and inorganic contaminants from soil and water and soil fertilization. Given its scope, the book appeals to a broad readership in various fields of chemical engineering, materials science, and environmental science.

Design, Theory and Applications in Porous Solids

Frontiers in Materials Science

Lignocellulosic Precursors Used in the Synthesis of Activated Carbon

Lignocellulosic Precursors Used in the Synthesis of Activated Carbon - Characterization Techniques and Applications in the Wastewater Treatment

Advances in Chitin/Chitosan Characterization and Applications

Select Proceedings of ICSTEESD 2020

Porous activated carbons are manufactured from a range of materials and have wide uses in industry for gas and liquid adsorption processes. Written by experts from around the world, this book covers the production, properties and applications of porous carbon.

This book is about thin films; what they are, how they are prepared, how they are characterized, and what they are used for. The contents of this book not only showcase the diversity of thin films, but also reveals the commonality among the work performed in a variety of areas. The chapters in this volume are based on invited papers presented by prominent researchers in the field at a Symposium on "Thin Films: Preparation, Characterization, Applications" at the 221st National Meeting of the American Chemical Society held in San Diego, California. The coverage of the symposium was extensive; topics ranged from highly-ordered metal adlayers on well-defined electrode surfaces to bio-organic films on non-metallic nanoparticles. An objective of this book is for the readers to be able to draw from the experience and results of others in order to improve and expand the understanding of the science and technology of their own thin films systems.

Functional advanced biopolymers have received far less attention than renewable biomass (cellulose, rubber, etc.) used for energy production. Among the most advanced biopolymers known is chitosan. The term chitosan refers to a family of polysaccharides obtained by partial de-N-acetylation from chitin, one of the most abundant renewable resources in the biosphere. Chitosan has been firmly established as having unique material properties as well as biological activities. Either in its native form or as a chemical derivative, chitosan is amenable to being processed—typically under mild conditions—into soft materials such as hydrogels, colloidal nanoparticles, or nanofibers. Given its multiple biological properties, including biodegradability, antimicrobial effects, gene transfectability, and metal adsorption—to name but a few—chitosan is regarded as a widely versatile building block in various sectors (e.g., agriculture, food, cosmetics, pharmacy) and for various applications (medical devices, metal adsorption, catalysis, etc.). This Special Issue presents an updated account addressing some of the major applications, including also chemical and enzymatic modifications of oligos and polymers. A better understanding of the properties that underpin the use of chitin and chitosan in different fields is key for boosting their more extensive industrial utilization, as well as to aid regulatory agencies in establishing specifications, guidelines, and standards for the different types of products and applications.

Carbon-Based Metal Free Catalysts: Preparation, Structural and Morphological Property and Application covers the different aspects of carbon-based metal free catalysts, including the fabrication of catalysts from natural sources and carbon allotropes, their manufacturing and design, characterization techniques, and applications. Special features in the book include illustrations and tables which summarize up-to-date information on research carried out on manufacturing, design, characterization and applications of metal free catalysts. This book assembles the information and knowledge on metal free catalysts and emphasizes the concept of green technology in the field of manufacturing and design. It is an ideal reference source for lecturers, students, researchers and industrialists working in the field of new catalyst development, especially polymer composites and is a valuable reference book handbook for teaching, learning, and research. Describes the design on metal-free catalysts Includes manufacturing technique of carbon-based metal free catalysts Lists applications of carbon-based metal free catalysts Discusses the characterization of carbon-based metal free catalysts

Preparation, Characterization, Applications

Biochar

Novel Carbon Adsorbents

Metal-free Functionalized Carbons in Catalysis

Activated Carbon Adsorption

Activated Carbon Fiber and Textiles