

CHARACTERIZATION OF IRON OXIDE NANOCATALYST IN

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Green Nanotechnology for Biofuel

Production - Neha Srivastava 2018-03-19

This book focuses on the use of nanotechnology and nanomaterials in the production of biofuels. It describes the current production technologies for different biofuels and their limitations for commercialization, and discusses in detail how nanomaterials could reduce biofuel production costs. After an introduction to biofuels, the book examines biofuels economics and policy; biofuel production processes - advances and limitations; nanotechnology and its energy applications; nanotechnology in biohydrogen production - for cellulases, in algal fuel, and in bioethanol/biobutanol and biodiesel production. It is a valuable resource for researchers and engineers.

Substrate Analysis for Effective Biofuels

Production - Neha Srivastava 2020-01-31

As a substrate, cellulose plays a crucial role in the biomass-based biofuel production process, and is essential to enzyme and sugar production. Accordingly, ensuring maximum availability of cellulose for enzyme production and bioconversion for sugar generation is one of the major challenges for sustainable biofuels production. To date there has been extensive research on biofuel production using lignocellulosic biomass, but there is a huge gap when it comes to the critical analysis of cellulose content, structural feasibility, availability, and economic processing, so that it can be converted for enzyme and fuel production at low cost. Consequently, this book discusses the availability

of lignocellulosic substrate for biofuel production in light of the challenges that the biofuels industry is currently facing. After identifying the major substrate selection challenges for the practical biofuel production process, the book addresses said challenges by focusing on various issues such as: potential substrates that have high cellulosic content, structural feasibility, and low-cost & effective processing to remedy the structural complexity of biomass structure and create added value. In addition, it covers recent advancements in cellulase production and outlines future prospects. Given its scope, it offers a valuable guide for research students and industry practitioners alike.

Nanocatalysis - Keshav Lalit Ameta 2022-07-08

The field of nanocatalysis is undergoing rapid development. Nanocatalysis can help in designing catalysts with excellent activity, greater selectivity, and high stability. Their properties can easily be tuned by tailoring the size, shape, and morphology of the particular nanomaterial. Exhibiting both homogeneous and heterogeneous catalytic properties, nanocatalysts allow for rapid and selective chemical transformations, with the benefits of excellent product yield and ease of catalyst separation and recovery. *Nanocatalysis: Synthesis of Bioactive Heterocycles* reviews the catalytic performance and the synthesis and characterization of nanocatalysts, examining the current state of the art and pointing the way towards new avenues of research specially synthesis of bioactive heterocycles. Top

researchers summarize synthetic methodologies for the synthesis of bioactive heterocycles using a nanocatalytic framework. The catalytic performance and the synthesis and characterization of nanocatalysts are reviewed. State of the art methods and new and emerging applications of nanocatalysts in the synthesis of biologically active heterocycles are detailed. Additional features include: Focuses on designing and synthesizing nanocatalysts specifically for the synthesis of different bioactive heterocycles. Demonstrates how nanocatalysis can produce catalysts with excellent activity, greater selectivity, and high stability. Explores tuning catalysts properties by tailoring the size, shape, and morphology of a nanomaterial. Offers the reader insights into the field of nanoscience via nanocatalysis. Nanocatalysis: Synthesis of Bioactive Heterocycles is a must read for researchers in organic chemistry, medicinal chemistry and biochemistry.

Advanced Nanocatalysts for Biodiesel Production - Bhaskar Singh 2022-09-22

Advanced Nanocatalysts for Biodiesel Production is a comprehensive and advanced book on practical and theoretical concepts of nanocatalysts dealing with future processing techniques towards environmental sustainability. The book critically discusses on latest emerging advanced nanocatalysts for biodiesel production aimed at reducing complexities and cost in the quest to meet future energy demands. Efforts have been made at clarifying the scope and limitations of biodiesel production in large-scale commercialization. The book discusses the size-dependent catalytic properties of nanomaterials and their working mechanisms in biodiesel production. Life cycle assessment of optimized viable feedstock from domestic as well as industrial waste is also addressed to improve the efficiency of biodiesel production. The book will be a valuable reference source for researchers and industrial professionals focusing on elementary depth analysis of nanocatalyst multifunctional technological applications in seeking key ideas for mimicking biodiesel production towards ecology and the economy. Key Features Provides a comprehensive environmental assessment of advanced nanocatalysts for biodiesel production to meet the world's energy demands Discusses the green

platform-based nanocatalysts like metal oxides/sulphides, 2D layered material synthesis and their relevance for biodiesel production. Presents a pathway for cheaper, cleaner and more environmentally friendly processing techniques for biodiesel production

Green Synthesis, Characterization and Applications of Nanoparticles - Ashutosh Kumar Shukla 2018-11-26

Green Synthesis, Characterization and Applications of Nanoparticles shows how eco-friendly nanoparticles are engineered and used. In particular, metal nanoparticles, metal oxide nanoparticles and other categories of nanoparticles are discussed. The book outlines a range of methodologies and explores the appropriate use of each. Characterization methods include spectroscopic, microscopic and diffraction methods, but magnetic resonance methods are also included as they can be used to understand the mechanism of nanoparticle synthesis using organisms. Applications covered include targeted drug delivery, water purification and hydrogen generation. This is an important research resource for those wishing to learn more about how eco-efficient nanoparticles can best be used. Theoretical details and mathematical derivations are kept to a necessary minimum to suit the need of interdisciplinary audiences and those who may be relatively new to the field. Explores recent trends in growth, characterization, properties and applications of nanoparticles Gives readers an understanding on how they are applied through the use of case studies and examples Assesses the advantages and disadvantages of a variety of synthesis and characterization techniques for green nanoparticles in different situations

Black Titanium Dioxide - Li Yiran 2021

The exploration and application of nanomaterials have been attracting researchers' attention in recent decades. Nanocatalysts, as one of the very important classes of nanomaterials, have been developed for several generations. Nanotechnology makes light be possibly utilized in catalysis rather than only heat and allows multifunctional parts to be assembled in one catalyst. The TiO₂ (as the representative of hetero-photocatalyst) and iron-based magnetic catalysts (as multifunctional catalyst) will be discussed in detail in this thesis. The first chapter

will introduce the background of catalysts and nanomaterials. TiO₂, especially black TiO₂, will be mainly discussed in the aspects of properties, synthesis, and applications. Another part of the chapter will talk about the separation-friendly catalyst - magnetic heterogenous catalysts' synthesis and applications. Chapter 2 focuses on the synthetic route we used and the characterization of black TiO₂ catalysts and magnetic catalysts. Both anatase and rutile black TiO₂ catalysts were successfully prepared originally from Degussa P25 using the ethanol reduction method. The re-whitening treatment was also examined on both black TiO₂ catalysts. All catalysts were characterized and compared by diffuse reflectance (DR), powder X-ray diffraction (XRD), and X-ray photoelectron spectroscopy (XPS). Tauc plot results show that black TiO₂ has smaller band gap than white TiO₂. XPS revealed the existence of surface -OH species and Ti³⁺ in black TiO₂. Furthermore, these two characterization techniques and XRD all proved that the blackening and re-whitening treatment does not change the crystalline phase of the catalysts, and the blackening treatment is reversible. For magnetic catalysts, we synthesized magnetic Fe₂O₃, Fe₂O₃@TiO₂, copper/iron oxide magnetic TiO₂, and black magnetic catalysts. Other than diffuse reflectance spectroscopy, Raman spectroscopy, scanning electron microscopy, and energy-dispersive X-ray elemental mapping analysis were used for determining the light-absorption properties, composition, and morphology of all synthesized magnetic catalysts. In addition, the magnetic separation was also achieved by simply applying an external magnetic field. Chapter 3 will discuss and compare the decarboxylation reaction activities of pristine, black, and re-whitened TiO₂ catalysts. The reactions were carried under the UV, blue, red, green, and white light irradiation. Unfortunately, the reaction was found only working under UV-light irradiation. The best solvent was dioxane which may be due to the proton affinity of the oxygen atom in dioxane molecule, which facilitates the deprotonation of the carboxylic acid. The optimal catalyst amount was found as 10 mg per 5 mL reaction mixture, and the kinetic study shows that the reaction is a pseudo-first order reaction. It is a pity that the performance of black TiO₂ catalysts is worse

than the pristine and re-whitened TiO₂. Chapter 4 will talk about the sol-gel synthesized magnetic catalysts. These catalysts were used for aldehyde-alkyne-amine (A₃) coupling reaction. The reaction was tested by light irradiating or traditional heating, but only heating can make the reaction proceed. Results also show that the coupling reaction requires copper to finish. The best solvent was found as toluene and the optimal reaction time is 6 hours at 120°C. Sadly, the reactivity of copper/iron oxide magnetic TiO₂ decreases a lot after three reaction cycles because of the copper leaching problem.

Synthetic Applications - Rajender S. Varma
2022-05-09

Magnetic nanocatalysts are an important tool for greener catalytic processes due to the ease of their removal from a reaction medium. This book explores different magnetic nanocatalysts, their use in synthesis, and their recyclability. Topics covered include magnetic nanocatalysts for S-S bond formation, N-heterocycle formation, C-heteroatom bond formation, silica-supported catalysts, multicomponent reactions, and their recyclability.

Magnetic Nanomaterials - 2009-09-15

The book series *Nanomaterials for the Life Sciences*, provides an in-depth overview of all nanomaterial types and their uses in the life sciences. Each volume is dedicated to a specific material class and covers fundamentals, synthesis and characterization strategies, structure-property relationships and biomedical applications. The series brings nanomaterials to the Life Scientists and life science to the Materials Scientists so that synergies are seen and developed to the fullest. Written by international experts of various facets of this exciting field of research, the series is aimed at scientists of the following disciplines: biology, chemistry, materials science, physics, bioengineering, and medicine, together with cell biology, biomedical engineering, pharmaceutical chemistry, and toxicology, both in academia and fundamental research as well as in pharmaceutical companies. **VOLUME 4 - Magnetic Nanomaterials** This volume takes the reader on a tour showing how magnetic nanomaterials are used in the fields of diagnosis and therapy, as well as in tissue engineering and environmental applications.

Applications of Advanced Green Materials -

Shakeel Ahmed 2020-10-22

Applications of Advanced Green Materials provides a comprehensive and authoritative review on recent advancement in green materials in various applications. Each chapter is focused on a specific application of advanced green materials from packaging to sensor technology, biomedical to environmental applications, textile to catalysis to electronic shielding applications, supercapacitors, drug delivery, tissue engineering, bioelectronic, gas storage and separation, etc. This book also discusses life cycle assessment and circular economy of green materials and their future prospective. The book is unique with contributions from renowned scientists working on biopolymers and biocomposites, bioactive and biodegradable materials, composites, and metallic natural materials. This book is an essential resource for academicians, researchers, students and professionals interested in exploring potential of advanced green materials. Includes up to date information on applications of advanced green materials Each chapter is specifically discussing a particular application with examples Present a unified approach to discuss in detail about origin, synthesis and application of green materials

Magnetic Oxides and Composites II - Rajshree B. Jotania 2020-10-15

Magnetic oxides have highly interesting applications in the fields of permanent magnets, microwave devices, magnetic refrigeration, sensors, catalysis, and the health sector. This book focuses on the synthesis, characterization, and applications of various perovskites, garnets, manganites, carbon-based metal oxide nanocomposites, nanoferrites, and graphene-metal oxide nanocomposites. Keywords: Magnetic Oxides, Permanent Magnets, Microwave Devices, Magnetic Refrigeration, Sensors, Catalysis, Perovskites, Nanoferrites, Manganites, Rare Earth Iron Garnet, Graphene-Metal Oxide Nanocomposites, Carbon Nanomaterials, Mesoporous Materials, Nanocatalysts, Multifunctional Ferrites, Magnetocaloric Effect, Biosynthesis, Photo Catalysis, Antibacterial Activity, High Density Recording Media.

Bioremediation and Sustainable Technologies for Cleaner Environment -

Marimuthu Prashanthi 2017-03-14

This book offers insights into the current focus and recent advances in bioremediation and green technology applications for waste minimization and pollution control. Increasing urbanization has an impact on the environment, agriculture and industry, exacerbating the pollution problem and creating an urgent need for sustainable and green eco-friendly remediation technology. Currently, there is heightened interest in environmental research, especially in the area of pollution remediation and waste conversion, and alternative, eco-friendly methods involving better usage of agricultural residues as economically viable substrates for environmental cleanup are still required. The book offers researchers and scholars inspiration, and suggests directions for specific waste management and pollution control. The research presented makes a valuable contribution toward a sustainable and eco-friendly societal environment.

The Fourteenth Annual Conference YUCOMAT 2012: Programme and the Book of Abstracts - Uskoković, Dragan P.

Nanotechnology in Catalysis - Bert Sels 2017-06-21

Reflecting the R&D efforts in the field that have resulted in a plethora of novel applications over the past decade, this handbook gives a comprehensive overview of the tangible benefits of nanotechnology in catalysis. By bridging fundamental research and industrial development, it provides a unique perspective on this scientifically and economically important field. While the first three parts are devoted to preparation and characterization of nanocatalysts, the final three provide in-depth insights into their applications in the fine chemicals industry, the energy industry, and for environmental protection, with expert authors reporting on real-life applications that are on the brink of commercialization. Timely reading for catalytic chemists, materials scientists, chemists in industry, and process engineers.

Green Synthesis of Nanomaterials for Bioenergy Applications - Manish Srivastava 2020-08-26

An authoritative summary of the quest for an environmentally sustainable synthesis process of nanomaterials and their application for

environmental sustainability Green Synthesis of Nanomaterials for Bioenergy Applications is an important guide that provides information on the fabrication of nanomaterial and the application of low cost, green methods. The book also explores the impact on various existing bioenergy approaches. Throughout the book, the contributors—noted experts on the topic—offer a reliable summary of the quest for an environmentally sustainable synthesis process of nanomaterials and their application to the field of environmental sustainability. The green synthesis of nanoparticles process has been widely accepted as a promising technique that can be applied to a variety of fields. The green nanotechnology-based production processes to fabricate nanomaterials operates under green conditions without the intervention of toxic chemicals. The book's exploration of more reliable and sustainable processes for the synthesis of nanomaterials, can lead to the commercial application of the economically viability of low-cost biofuels production. This important book: Summarizes the quest for an environmentally sustainable synthesis process of nanomaterials for their application to the field of environmental sustainability Offers an alternate, sustainable green energy approach that can be commercially implemented worldwide Covers recent approaches such as fabrication of nanomaterial that apply low cost, green methods and examines its impact on various existing bioenergy applications Written for researchers, academics and students of nanotechnology, nanosciences, bioenergy, material science, environmental sciences, and pollution control, Green Synthesis of Nanomaterials for Bioenergy Applications is a must-have guide that covers green synthesis and characterization of nanomaterials for cost effective bioenergy applications.

Advances in Nanostructured Materials - Bibhu Prasad Swain 2022

This book presents recent advances in nanostructured materials. It describes the characterization of nanomaterials, their preparation methods and performance testing techniques; the design and development of nano-scale devices; and the applications of nanomaterials, with examples taken from different industries, such as energy,

bioengineering and medicine. The book is broadly divided into sections such as nanostructure semiconductor materials for device applications, nanostructured ferroelectric and ferromagnetic materials.. The topics covered include experimental approaches of device fabrication, photovoltaics and supercapacitors applications, etc. Given the contents, the book will be useful for students, researchers, and professionals working in the area of nanotechnology and nanomaterials.

Nanocatalysis - Vanesa Calvino-Casilda 2019-02-14

Synthesis and design of new nanocatalysts is an important area of research that aims to introduce multiple types of useful applications in a greener market. The necessity of nanostructuring the active sites has emerged as the key point in a successful design of the catalysts. The book covers the progress in this research area done in the last ten years. It includes the classification of catalysts and structure of active sites at the nanoscale. The book covers examples to present the concept, evolution of nanocatalysts from the perspective of chemistry of materials and their applications.

Oxides for Medical Applications - Piyush Kumar 2023-03-28

Oxides for Medical Applications reviews the most important advances of oxides with optical, magnetic and electronic properties for biomedical applications. Owing to their unusual properties, oxides are expected to play a significant role in the prevention or early treatment of diseases. In addition to catalytically active artificial enzymes based on oxide materials—the book provides comprehensive coverage of the most relevant categories of oxide materials and their properties and applications. Since magnetic oxides are used extensively for a wide range of medical applications, there are numerous chapters that address these materials, including LSMO nanoparticles, ferrites, nanocatalysts, and more. Finally, practical considerations for the translation of these materials from the lab to the clinic are reviewed, including biocompatibility and toxicity of oxide nanoparticles, making this a suitable resource for researchers and practitioners in materials science and engineering in academia and the clinic. Reviews the unique properties and

synthesis strategies of oxide materials for medical applications Provides an overview of the most relevant medical applications of oxide materials such as their use in biosensing, drug delivery, tissue engineering, and more Discusses practical considerations of the commercial translation of oxide materials, including their biocompatibility

Gas-Phase Synthesis of Nanoparticles - Yves Huttel 2017-06-19

The first overview of this topic begins with some historical aspects and a survey of the principles of the gas aggregation method. The second part covers modifications of this method resulting in different specialized techniques, while the third discusses the post-growth treatment that can be applied to the nanoparticles. The whole is rounded off by a review of future perspectives and the challenges facing the scientific and industrial communities. An excellent resource for anyone working with the synthesis of nanoparticles, both in academia and industry.

Nanocatalysts in Biofuel Process Optimization - Mohammad Rehan 2021-11-26

Nanotechnology - Sunipa Roy 2017-09-18
Nano particles have created a high interest in recent years by virtue of their unusual mechanical, electrical, optical and magnetic properties and find wide applications in all fields of engineering. This edited volume aims to present the latest trends and updates in nanogenerators, thin film solar cells and green synthesis of metallic nanoparticles with a focus on nanostructured semiconductor devices. Exclusive chapter on electrical transport of nanostructure explains device physics for material properties for reduced dimensions. Additionally, the text describes the functionality of metallic nanoparticles and their application in molecular imaging and optical metamaterials. Piezoelectric nanogenerators has been touched upon from the energy perspective as well. Key Features: • Organized contents on Nanogenerators, VOC sensing, nanoelectronics, and NEMS. • Discusses eco-friendly green synthesis methods for metallic nanoparticles. • Touches upon low power nano devices (e.g. nanogenerators) for energy harvesting with quantum mechanical study. • Thin film/heterojunction based high efficiency solar

cell addressed aimed at reducing global energy consumption.

Colloidal Nanoparticles - Nikhil R Jana 2019-03-26

This book will focus on synthesis, coating and functionalization chemistry of selected nanoparticles that are most commonly used in various biomedical applications. Apart from standard selected chemical synthetic methods, it focusses on design consideration of functionalization, selected coating chemistry for transforming as synthesized nanoparticle, selected conjugation chemistries and purification approach for such nanoparticles. It also includes state-of-art/future prospect of nanodrugs suitable for clinical applications. There will material on general application potential of these nanoparticles, importance of functionalization and common problems faced by non-chemists.

Functional Properties of Advanced Engineering Materials and Biomolecules - Felipe A. La Porta 2021-05-17

This book shows how a small toolbox of experimental techniques, physical chemistry concepts as well as quantum/classical mechanics and statistical methods can be used to understand, explain and even predict extraordinary applications of these advanced engineering materials and biomolecules. It highlights how improving the material foresight by design, including the fundamental understanding of their physical and chemical properties, can provide new technological levels in the future.

Nanocatalysts - Indrajit Sinha 2019-07-31
Nanocatalysis is a topical area of research that has huge potential. It attempts to merge the advantages of heterogeneous and homogeneous catalysis. The collection of articles in this book treats the topics of specificity, activity, reusability, and stability of the catalyst and presents a compilation of articles that focuses on different aspects of these issues.

Sustainable Catalytic Processes - Basudeb Saha 2015-06-11

The development of catalysts is the most sophisticated art in chemical sciences. It can be read like a story book when the critical scientific contents are presented in a chronological manner with short and simple sentences. This book will meets these criteria. To address the

sustainability issues of existing chemical manufacturing processes or producing new chemicals, researchers are developing alternate catalysts to eliminate toxic chemicals use and by-products formation. Sustainable Catalytic Processes presents critical discussions of the progress of such catalytic development. This book of contemporary research results in sustainable catalysis area will benefit scientists in both industries and academia, and students to learn recent catalysts/process development. Reports the most recent developments in catalysis with a focus on environmentally friendly commercial processes, such as waste water treatment, alternate energy, etc Bridges the theory, necessary for the development of environmentally friendly processes, and their implementation through pilot plant and large scale Contains mainly laboratory scale data and encourages industrial scientists to test these processes on a pilot scale Includes work examples featuring the development of the new catalysts/processes using bio-renewable feedstock satisfactorily addressing environmental concerns Includes one chapter demonstrating real industrial examples motivating the industrial and academic researchers to pursue similar research

Nano-Bioremediation: Fundamentals and Applications - Hafiz M.N. Iqbal 2021-11-10

Nano-Bioremediation: Fundamentals and Applications explores how nano-bioremediation is used to remedy environmental pollutants. The book's chapters focus on the design, fabrication and application of advanced nanomaterials and their integration with biotechnological processes for the monitoring and treatment of pollutants in environmental matrices. It is an important reference source for materials scientists, engineers and environmental scientists who are looking to increase their understanding of bioremediation at the nanoscale. The mitigation of environmental pollution is the biggest challenge to researchers and the scientific community, hence this book provides answers to some important questions. As an advanced hybrid technology, nano-bioremediation refers to the integration of nanomaterials and bioremediation for the remediation of pollutants. The rapid pace of urbanization, massive development of industrial sectors, and modern

agricultural practices all cause a controlled or uncontrolled release of environmentally-related hazardous contaminants that are seriously threatening every key sphere, including the atmosphere, hydrosphere, biosphere, lithosphere, and anthroposphere. Explores the current and potential applications of nano-bioremediation in the remediation of hazardous pollutants Outlines the major properties and classes of nanomaterials that make them efficient bioremediation agents Assesses the major challenges of effectively implementing bioremediation techniques at the nanoscale

Metal Oxide Nanoparticles in Organic Solvents - Markus Niederberger 2009-09-17

Metal Oxide Nanoparticles in Organic Solvents discusses recent advances in the chemistry involved for the controlled synthesis and assembly of metal oxide nanoparticles, the characterizations required by such nanoobjects, and their size and shape depending properties. In the last few years, a valuable alternative to the well-known aqueous sol-gel processes was developed in the form of nonaqueous solution routes. Metal Oxide Nanoparticles in Organic Solvents reviews and compares surfactant- and solvent-controlled routes, as well as providing an overview of techniques for the characterization of metal oxide nanoparticles, crystallization pathways, the physical properties of metal oxide nanoparticles, their applications in diverse fields of technology, and their assembly into larger nano- and mesostructures. Researchers and postgraduates in the fields of nanomaterials and sol-gel chemistry will appreciate this book's informative approach to chemical formation mechanisms in relation to metal oxides.

Solvent-Free Methods in Nanocatalysis - Rafael Luque 2023-01-11

Solvent-Free Methods in Nanocatalysis Discover solvent-free approaches for the synthesis of nanocatalysts as well as various catalytic transformations in this unique one-stop resource Solvent-free methods have attracted wide attention in organic synthesis and catalysis as a promising approach towards "greener" and more sustainable chemical transformations. In this regard, nanocatalysis has seen particular growth in recent years. Solvent-Free Methods in Nanocatalysis gives an in-depth overview of nanocatalysts and their catalytic applications

using solvent-free methods. After a brief introduction, it covers various synthetic techniques for the preparation of nanocatalysts and supports using solvent-free methods, e.g. ball-milling, microwave- and plasma-assisted methods. The book discusses in detail different catalyst classes, such as metal oxides, doped and functionalized nanocarbons, as well as nitride- and silica-based materials to help researchers to understand the efficiency and nature of these catalysts/supports based on their chemical structure. In the book readers will also find: A brief account of the history, challenges, and recent advances in the field Detailed discussion of advantages and disadvantages of solvent-free techniques for nanocatalyst preparation Treatment of important solvent- and catalyst-free organic transformations (i.e. oxidation, coupling and multicomponent reactions) A chapter on supported ionic liquids for solvent-free catalysis Written by leading researchers in the field, Solvent-Free Methods in Nanocatalysis is a useful reference for researchers and students working in organic synthesis, catalysis, and nanomaterials science.

Inorganic Anticorrosive Materials - Chandrabhan Verma 2021-11-24

Inorganic Anticorrosive Materials (IAMs): Past, Present, and Future Perspectives covers the anticorrosive effects of inorganic materials and metal oxides in particular. The book presents the latest developments in corrosion inhibition and discusses future opportunities. It also addresses the fundamental characteristics, synthesis, inhibition mechanisms, and applications of metal oxides as corrosion inhibitors in industry and provides a chronological overview of the growth of the field. The book concludes with discussions about commercialization and economics. This book is an indispensable reference for scholars, chemical engineers, chemists, and materials scientists working in research and development and in academia who require comprehensive knowledge of corrosion-inhibition mechanisms. Utilizes metal oxides as corrosion inhibitors for usage in modern industrial platforms Evaluates corrosion inhibitors as prime options for sustainable and transformational opportunities Provides up-to-date reference materials, including websites of interest and information about ongoing research

Magnetic Nanoparticles - Nguyen TK Thanh 2012-02-01

Offering the latest information in magnetic nanoparticle (MNP) research, Magnetic Nanoparticles: From Fabrication to Clinical Applications provides a comprehensive review, from synthesis, characterization, and biofunctionalization to clinical applications of MNPs, including the diagnosis and treatment of cancers. This book, written by some of the most qualified experts in the field, not only fills a hole in the literature, but also bridges the gaps between all the different areas in this field. Translational research on tailored magnetic nanoparticles for biomedical applications spans a variety of disciplines, and putting together the most significant advances into a practical format is a challenging task. Balancing clinical applications with the underlying theory and foundational science behind these new discoveries, Magnetic Nanoparticles: From Fabrication to Clinical Applications supplies a toolbox of solutions and ideas for scientists in the field and for young researchers interested in magnetic nanoparticles.

Scientific and Clinical Applications of Magnetic Carriers - Urs Häfeli 2013-11-11

The discovery of uniform latex particles by polymer chemists of the Dow Chemical Company nearly 50 years ago opened up new exciting fields for scientists and physicians and established many new biomedical applications. Many in vitro diagnostic tests such as the latex agglutination tests, analytical cell and phagocytosis tests have since become routine. They were all developed on the basis of small particles bound to biological active molecules and fluorescent and radioactive markers. Further developments are ongoing, with the focus now shifted to applications of polymer particles in the controlled and directed transport of drugs in living systems. Four important factors make microspheres interesting for in vivo applications: First, biocompatible polymer particles can be used to transport known amounts of drug and release them in a controlled fashion. Second, particles can be made of materials which biodegrade in living organisms without doing any harm. Third, particles with modified surfaces are able to avoid rapid capture by the reticuloendothelial system and therefore en

hance their blood circulation time. Fourth, combining particles with specific molecules may allow organ-directed targeting.

Green Chemical Analysis and Sample Preparations - Mahmoud H. El-Maghrabey
2022-06-20

This volume focuses on the most recent trends for greening analytical activities beginning with an introduction to green analytical chemistry followed by a discussion of green analytical chemistry metrics and life-cycle assessment approach to analytical method development. The chapters discuss two main topics; first is the most recent techniques for greening sample pretreatment steps, and second is modern trends for tailoring analytical techniques and instrumentation to implement the green analytical chemistry concept. The role of different kinds of green solvents, such as ionic liquids, supercritical fluids, deep eutectic solvents, bio-based solvents, and surfactants, as well as nanomaterials and green sorption materials in greening sample extraction steps is also a focus of this book. Furthermore, different approaches for greening chromatography as a key analytical technique are discussed. The applications of nanomaterials in analytical procedures are deeply reviewed, and miniaturization of spectrometers is also discussed as a recently evolved approach for efficient green on-site analysis. This book will appeal to a wide readership of academic and industrial researchers in different fields. It can be used in the classroom for undergraduate and postgraduate students focusing on the development of new analytical procedures for organic and inorganic compounds determination in different kinds of samples characterized by complex matrices composition. The book will also be useful for researchers that are interested in both chemical analysis and environment protection.

Nanoparticles and Catalysis - Didier Astruc
2008-06-25

Written by international experts, this monograph combines two of the most important aspects of modern chemistry, presenting the latest knowledge on these environmental friendly applications. This result is a comprehensive overview of the application of nanoparticles in catalysis, focusing on synthesis and the most

important reaction types, providing all the information needed by catalytic, organic and solid state chemists, as well as those working with or on organometallics, materials scientists, and chemists in industry.

Emerging Nanotechnologies for Water Treatment - Yanbiao Liu 2021-11-03

Rapid population growth, urbanisation and industrialisation have caused serious problems in terms of water pollution and the supply of safe water. Solutions for monitoring pollutants in water and for removing them are urgently needed and they must be both efficient and sustainable. Recent advances in emerging environmental nanotechnologies provide promising solutions for these issues. The physical and chemical properties of nanomaterials can be tailored by controlling attributes such as their size, shape, composition, and surface, so that they can be both highly specific and highly efficient. This makes them perfect platforms for a variety of environmental applications including sensing, treatment and remediation. Providing an array of cutting-edge nanotechnology research in water applications, including sensing, treatment, and remediation, as well as a discussion of progress in the rational design and engineering of nanomaterials for environmental applications, this book is a valuable reference for researchers working in applications for nanotechnology, environmental chemistry and environmental engineering as well as those working in the water treatment industry.

Metal Nanoparticles - Daniel L. Fedlheim
2001-10-26

A state-of-the-art reference, *Metal Nanoparticles* offers the latest research on the synthesis, characterization, and applications of nanoparticles. Following an introduction of structural, optical, electronic, and electrochemical properties of nanoparticles, the book elaborates on nanoclusters, hyper-Raleigh scattering, nanoarrays, and several applications including single electron devices, chemical sensors, biomolecule sensors, and DNA detection. The text emphasizes how size, shape, and surface chemistry affect particle performance throughout. Topics include synthesis and formation of nanoclusters, nanosphere lithography, modeling of nanoparticle optical properties, and biomolecule

sensors.

Synthesis of Inorganic Nanomaterials -

Sneha Mohan 2018-06-29

Synthesis of Inorganic Nanomaterials: Advances and Key Technologies discusses the latest advancements in the synthesis of various types of nanomaterials. The book's main objective is to provide a comprehensive review regarding the latest advances in synthesis protocols that includes up-to-date data records on the synthesis of all kinds of inorganic nanostructures using various physical and chemical methods. The synthesis of all important nanomaterials, such as carbon nanostructures, Core-shell Quantum dots, Metal and metal oxide nanostructures, Nanoferrites, polymer nanostructures, nanofibers, and smart nanomaterials are discussed, making this a one-stop reference resource on research accomplishments in this area. Leading researchers from industry, academia, government and private research institutions across the globe have contributed to the book. Academics, researchers, scientists, engineers and students working in the field of polymer nanocomposites will benefit from its solutions for material problems. Provides an up-to-date data record on the synthesis of all kinds of organic and inorganic nanostructures using various physical and chemical methods Presents the latest advances in synthesis protocols Includes the latest techniques used in the physical and chemical characterization of nanomaterials Covers the characterization of all the important materials groups, such as carbon nanostructures, core-shell quantum dots, metal and metal oxide nanostructures, Nano ferrites, polymer nanostructures and nanofibers

Advanced Catalytic Materials - Noreña Luis
2016-02-03

Today's chemical industry processes worldwide largely depend on catalytic reactions and the desirable future evolution of this industry toward more selective products, more environmentally friendly products, more energy-efficient processes, a smaller use of hazardous reagents, and a better use of raw materials also largely involves the development of better catalysts and, specifically, purposely designed catalytic materials. The careful study and development of the new-generation catalysts involve relatively large groups of specialists in universities,

research centers, and industries, joining forces from different scientific and technical disciplines. This book has put together recent, state-of-the-art topics on current trends in catalytic materials and consists of 16 chapters.

Nanocatalysis - Ulrich Heiz 2007-01-10

Nanocatalysis, a subdiscipline of nanoscience, seeks to control chemical reactions by changing the size, dimensionality, chemical composition, and morphology of the reaction center and by changing the kinetics using nanopatterning of the reaction center. This book offers a detailed pedagogical and methodological overview of the field. Readers discover many examples of current research, helping them explore new and emerging applications.

TiO₂ Nanoparticles - Aiguo Wu 2020-02-12

A unique book that summarizes the properties, toxicology, and biomedical applications of TiO₂-based nanoparticles Nanotechnology is becoming increasingly important for products used in our daily lives. Nanometer-sized titanium dioxide (TiO₂) are widely used in industry for different purposes, such as painting, sunscreen, printing, cosmetics, biomedicine, and so on. This book summarizes the advances of TiO₂ based nanobiotechnology and nanomedicine, covering materials properties, toxicological research, and biomedical application, such as antibacter, biosensing, and cancer theranostics. It uniquely integrates the TiO₂ applications from physical properties, toxicology to various biomedical applications, and includes black TiO₂ based cancer theranostics. Beginning with a comprehensive introduction to the properties and applications of nanoparticles, TiO₂ Nanoparticles: Applications in Nanobiotechnology, Theranostics and Nanomedicine offers chapters on: Toxicity of TiO₂ Nanoparticles; Antibacterial Applications of TiO₂ Nanoparticles; Surface Enhanced Raman Spectrum of TiO₂ Nanoparticle for Biosensing (TiO₂ Nanoparticle Served as SERS Sensing Substrate); TiO₂ as Inorganic Photosensitizer for Photodynamic Therapy; Cancer Theranostics of Black TiO₂ Nanoparticles; and Neurodegenerative Disease Diagnostics and Therapy of TiO₂-Based Nanoparticles. This title: - Blends the physical properties, toxicology of TiO₂ nanoparticles to the many biomedical applications -Includes black TiO₂ based cancer theranostics in its coverage -Appeals to a broad

audience of researchers in academia and industry working on nanomaterials-based biosensing, drug delivery, nanomedicine TiO₂ Nanoparticles: Applications in Nanobiotechnology, Theranostics and Nanomedicine is an ideal book for medicinal chemists, analytical chemists, biochemists, materials scientists, toxicologists, and those in the pharmaceutical industry.

Nanotechnology in Catalysis 3 - Bing Zhou
2007-09-05

This volume continues the tradition formed in *Nanotechnology in Catalysis 1* and *2*. As with those books, this one is based upon an ACS symposium. Some of the most illustrious names in heterogeneous catalysis are among the contributors. The book covers: Design, synthesis, and control of catalysts at nanoscale; understanding of catalytic reaction at nanometer scale; characterization of nanomaterials as

catalysts; nanoparticle metal or metal oxides catalysts; nanomaterials as catalyst supports; new catalytic applications of nanomaterials. [Heterogeneous Nanocatalysis for Energy and Environmental Sustainability, Volume 2](#) - Putla Sudarsanam 2022-11-01

Explore the environmental applications of heterogeneous nanocatalysis in the field of alternative energy production In *Volume 2: Environmental Applications of Heterogeneous Nanocatalysis for Energy and Environmental Sustainability*, a team of distinguished researchers discusses the foundational concepts and practical applications of heterogeneous nanocatalysis for alternative energy production. *Volume 2* focuses on the purification of auto exhaust pollutants and volatile organic compounds, as well as CO₂ conversion and wastewater treatment over a range of nano-sized catalysts.