

SPRINGER BRIEFS IN MOLECULAR SCIENCE
GREEN CHEMISTRY FOR SUSTAINABILITY

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Reena Amatya Shrestha

Ultrasound Technology in Green Chemistry



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Ultrasound Technology In Green Chemistry Springerbriefs In Molecular Science

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Ultrasound Technology In Green Chemistry Springerbriefs In Molecular Science:

Ultrasound Technology in Green Chemistry Mika Sillanpää, Thuy-Duong Pham, Reena Amatya Shrestha, 2011-08-26 As a new and rapidly growing science the applications of ultrasound methods in environmental technology hold a promising future Compared to conventional methods ultrasonication can bring several benefits such as being environmentally friendly no toxic chemical are used or produced low cost and compact allowing on site treatment Besides an overview featuring the background behind ultrasonic technology this brief summarizes the main studies and innovations reported in recent research that has utilized ultrasound methods in environmental analysis water and sludge treatment soil and sediment remediation to air purification *Sonochemistry: New Opportunities For Green Chemistry* Gregory Chatel, 2016-12-22 The application of ultrasound waves to chemical reactions sonochemistry has huge potential for innovation in eco friendly and eco efficient chemistry Sonochemistry New Opportunities for Green Chemistry first introduces the basics of ultrasonic waves and the history of sonochemistry before moving on to look at acoustic cavitation and the estimation of ultrasonic parameters After this comes a discussion of the equipment needed for experimentation with sonochemistry Finally there is an in depth look at green sonochemistry in different fields of research covering concepts such as new combinations of ultrasound with ionic liquids microwave irradiation enzyme combination and sono assisted electrochemistry In conclusion distinguished sonochemists from around the world share their opinions on the green sonochemistry and their predictions in the field Undergraduate and graduate students in chemistry and practitioners of ultrasonic technology will gain a unique insight into the opportunities and challenges facing sonochemistry today in its theoretical and practical implementation

Photocatalytic Nanomaterials for Environmental Applications Rajesh J. Tayade, Vimal Gandhi, 2018-02-25 Photocatalytic nanomaterials have a great potential in such applications as reduction of carbon dioxide and degradation of various pollutants They are equally important in the production and storage of energy e g in the conversion of solar energy to electricity and the production of hydrogen in photoelectrochemical cells Research on synthesis characterization and specific applications is reported for titanium oxide and a number of other promising catalysts such as silver phosphate cerium oxide zinc oxide and zinc sulfide *NexGen Technologies for Mining and Fuel Industries (Volume I and II)* Pradeep K. Singh, V.K. Singh, A.K. Singh, D. Kumbhakar, M.P. Roy, 2017-03-06 The papers in these two volumes were presented at the International Conference on NexGen Technologies for Mining and Fuel Industries NxGnMiFu 2017 in New Delhi from February 15 17 2017 organized by CSIR Central Institute of Mining and Fuel Research Dhanbad India The proceedings include the contributions from authors across the globe on the latest research on mining and fuel technologies The major issues focused on are Innovative Mining Technology Rock Mechanics and Stability Analysis Advances in Explosives and Blasting Mine Safety and Risk Management Computer Simulation and Mine Automation Natural Resource Management for Sustainable Development Environmental Impacts and Remediation Paste Fill Technology and Waste Utilisation Fly Ash Management Clean Coal

Initiatives Mineral Processing and Coal Beneficiation Quality Coal for Power Generation and Conventional and Non conventional Fuels and Gases This collection of contemporary articles contains unique knowledge case studies ideas and insights a must have for researchers and engineers working in the areas of mining technologies and fuel sciences

Efficient Coating Materials for Magnetite Nanoparticles Noorashikin Md Saleh,Tanusha Devi,Nik Nur Atiqah Nik Wee,Beh Shiuan Yih,Siti Khalijah Mad Rozi,Nasuha Binti Mohamad Nasrol,2024-11-05 The book explores the significant contribution of magnetic nanoparticles MNPs as great adsorbents for the adsorption of multifarious pollutants from water sources With the advance of technology using magnetic nanoparticles has become one of the practical approaches to purifying water from various pollutants The book provides an in depth overview of the magnetic properties of nanoparticles synthesis methods and their applications in the adsorption of heavy metals organic compounds and other pollutants in water Readers will get an insight into the essential aspects of this technology and how its adoption might enhance water quality for environmental sustainability and human health This book is appropriate for researchers scholars and practitioners in environmental chemistry and water technology due to its comprehensive yet easily understandable discussions

Energy Aspects of Acoustic Cavitation and Sonochemistry Oualid Hamdaoui,Kaouthar Kerboua,2022-08-06 Energy Aspects of Acoustic Cavitation and Sonochemistry Fundamentals and Engineering covers topics ranging from fundamental modeling to up scaled experiments The book relates acoustic cavitation and its intrinsic energy balance to macroscopic physical and chemical events that are analyzed from an energetic perspective Outcomes are directly projected into practical applications and technological assessments covering energy consumption thermal dissipation and energy efficiency of a diverse set of applications in mixed phase synthesis environmental remediation and materials chemistry Special interest is dedicated to the sonochemical production of hydrogen and its energetic dimensions Due to the sensitive energy balance that governs this process this is seen as a green process for the production of future energy carriers Provides a concise and detailed description of energy conversion and exchange within the single acoustic cavitation bubble and bubble population accompanying physical and chemical effects Features a comprehensive approach that is supported by experiments and the modeling of energy concentration within the sonochemical reactor jointly with energy dissipation and damping phenomenon Gives a clear definition of energy efficiency metrics of industrial sono processes and their application to the main emergent industrial fields harnessing acoustic cavitation and sonochemistry notably for the production of hydrogen

Advancements in Textile Coloration Mohammad Shahid,Saptarshi Maiti,Shafat Ahmad Khan,Ravindra V. Adivarekar,2025-08-02 The book highlights the latest innovations in sustainable textile dyeing and printing addressing the industry s growing need for eco friendly solutions This comprehensive book covers many topics including waterless dyeing air and dope dyeing technologies electrochemical dyeing and bio based mordants and colorants It also delves into microbial dyes statistical approaches for optimizing coloration and advanced surface modification techniques Additionally the book examines the evolution of textile

printing from conventional to digital methods and discusses strategies for mitigating textile effluent pollution With a strong emphasis on sustainability this resource is invaluable for researchers industry professionals and academicians committed to advancing responsible textile coloration practices

Encyclopedia of Renewable and Sustainable Materials

,2020-01-09 Encyclopedia of Renewable and Sustainable Materials Five Volume Set provides a comprehensive overview covering research and development on all aspects of renewable recyclable and sustainable materials The use of renewable and sustainable materials in building construction the automotive sector energy textiles and others can create markets for agricultural products and additional revenue streams for farmers as well as significantly reduce carbon dioxide CO₂ emissions manufacturing energy requirements manufacturing costs and waste This book provides researchers students and professionals in materials science and engineering with tactics and information as they face increasingly complex challenges around the development selection and use of construction and manufacturing materials Covers a broad range of topics not available elsewhere in one resource Arranged thematically for ease of navigation Discusses key features on processing use application and the environmental benefits of renewable and sustainable materials Contains a special focus on sustainability that will lead to the reduction of carbon emissions and enhance protection of the natural environment with regard to sustainable materials

Adding Value to Fruit Wastes Sneha Punia Bangar, Parmjit S Panesar, 2024-06-01 Value Addition of Fruit Wastes Extraction Properties and Applications provides the latest technologies used in fruit waste to extract isolate and characterize functional active compounds and their diversified pharmacological food agricultural and industrial applications Divided in 3 sections the book explores emerging technologies for extraction of functional components thoroughly discusses value added components and works as a guide to its applications The book also covers fruit wastes for extracting starch to provide more cereal crops available as food besides supporting the efficient utilization of fruit wastes to bring many more opportunities for extraction of functional components in a sustainable manner for food applications Written by a team of experts in the field this book provides technicians researchers food technology experts food industry personnel and academia with value addition to the fruit waste and a lot more opportunities for extraction of functional components in a sustainable manner for food applications Covers valorization approaches of fruit waste for starch protein fibers and phenolics Includes novel green techniques for the extraction of the functional compounds Brings industrial applications of value added functional compounds

Ultrasonic Synthesis of Functional Materials Muthupandian Ashokkumar, 2016-01-11 This book begins by giving a summary of sonochemistry and explains how a chemical reaction can be induced by the interaction of sound waves and gas bubbles in liquids The work outlines how primary and secondary radicals combined with the physical effects generated during acoustic cavitation are active in the ultrasonic synthesis of a variety of functional materials The brief covers hot topics that include ultrasonic synthesis of various functional materials covering the following broad areas acoustic cavitation and sonochemistry synthesis of functional polymers and their applications synthesis of functional

inorganic materials and their applications improving functionality of food dairy systems synthesis of functional biomaterials and their applications synthesis of graphene based catalytic materials Theory is kept to a minimum The book is aimed at individuals at universities and will also interest those in industry It is suitable for all levels

Ultrasound Technology in Dairy Processing Jayani Chandrapala, Bogdan Zisu, 2018-07-12 This SpringerBrief provides an overview of the use of ultrasound in various dairy applications highlighting their significant benefits for the dairy industry including energy savings and product improvement It describes in detail the physical and chemical effects of high and low frequency power ultrasound in specific applications such as emulsification ultrafiltration crystallisation inactivation of microbes functionality modifications of secondary dairy products and fat separation Although to date the majority of these applications have only been proven in the laboratory some have been successfully implemented on a larger scale By offering a concise review that includes the transition from laboratory scale projects to large scale commercialization this SpringerBrief fills a gap in the literature Ultrasound processing has the advantage of minimising flavour loss increasing homogeneity reducing energy requirements reducing processing times enhancing end product quality reducing chemical and physical hazards and lowering the environmental impact compared to conventional dairy processes As a result the use of ultrasound in the dairy industry has become a hot topic and has generated considerable research interest in recent years The SpringerBrief is intended for industry professionals researchers and graduate students with a basic understanding of simple ultrasound especially those starting on a new topic of research or coming into the field

Handbook on Applications of Ultrasound Dong Chen, Sanjay K. Sharma, Ackmez Mudhoo, 2011-07-26 Ultrasonic irradiation and the associated sonochemical and sonophysical effects are complementary techniques for driving more efficient chemical reactions and yields Sonochemistry the chemical effects and applications of ultrasonic waves and sustainable green chemistry both aim to use less hazardous chemicals and solvents reduce energy consumption and increase product selectivity A comprehensive collection of knowledge Handbook on Applications of Ultrasound covers the most relevant aspects linked to and linking green chemistry practices to environmental sustainability through the uses and applications of ultrasound mediated and ultrasound assisted biological biochemical chemical and physical processes Chapters are presented in the areas of Medical applications Drug and gene delivery Nanotechnology Food technology Synthetic applications and organic chemistry Anaerobic digestion Environmental contaminants degradation Polymer chemistry Industrial syntheses and processes Reactor design Electrochemical systems Combined ultrasound microwave technologies While the concepts of sonochemistry have been known for more than 80 years in depth understanding of this phenomenon continues to evolve Through a review of the current status of chemical and physical science and engineering in developing more environmentally friendly and less toxic synthetic processes this book highlights many existing applications and the enormous potential of ultrasound technology to upgrade present industrial agricultural and environmental processes

Advances in Ultrasound Technology for Environmental Remediation Ta

Yeong Wu, Ningqun Guo, Chee Yang Teh, Jacqueline Xiao Wen Hay, 2012-10-21 Over the past ten years innovative technologies have shown that advanced oxidation processes are highly promising when applied to the remediation of polluted water or wastewater as they don't generate any sludge or solid material of hazardous nature *Advances in Ultrasound Technology for Environmental Remediation* reviews the fundamentals of ultrasound technology and the state of the art developments in ultrasound based free radical generation in environmental remediation and pollution prevention It also presents the challenges of introducing ultrasound technology into large scale environmental remediation applications and examines the methods used to improve ultrasound technology Indeed ultrasonic systems are extremely sensitive and vulnerable to operational parameters which cannot be controlled without a good knowledge and understanding of physical and chemical phenomena *Advances in Ultrasound Technology for Environmental Remediation* features the theory and fundamentals of ultrasound technology and discusses its potential as an alternative method in environmental remediation **Organic Sonochemistry**

Jean-Marc L  v  que, Giancarlo Cravotto, Fran  ois Delattre, Pedro Cintas, 2018-10-11 This book provides informative useful and stimulating reading on the topic of organic sonochemistry the core of ultrasound based applications Given the increasing interest in new and improved technologies allied to their green and sustainable character not always a valid premise there is a great attraction for organic chemists to apply these protocols in synthesis and process chemistry Unfortunately as with other enabling technologies many researchers new to the field have received a simple and dishonest message just switch on Therefore a significant portion of sonochemical syntheses lack reproducibility surprisingly cavitation control and or ultrasonic parameters are omitted and the actual role of sonication remains uncertain While this book does not provide a detailed description of fundamentals the introductory remarks highlight the importance of cavitational effects and their experimental control It presents a number of concepts of sonochemical reactivity and empirical rules with pertinent examples often from classical and recent literature It then focuses on scenarios of current interest where organic chemistry and synthesis in particular may benefit from sonication in terms of both chemical and mechanical activation The sustainable corner of this field is largely exemplified through concepts like atom economy renewable sources wasteless syntheses and benign solvents as reaction media This book is useful for both researchers and graduate students especially those familiar with the field of sonochemistry and applications of ultrasound in general However it is also of interest to a broader audience as it discusses the fundamentals techniques and experimental skills necessary for scientists wishing to initiate the use of ultrasound in their domain of expertise **Introduction to Ultrasound, Sonochemistry and Sonoelectrochemistry**

Bruno G. Pollet, Muthupandian Ashokkumar, 2019-08-29 This book provides an introduction to the fundamental and applied aspects of sonochemistry discussing a number of basic concepts in sonochemistry such as how ultrasonic waves interact with gas bubbles in liquids to generate cavitation and how the high temperatures generated within cavitation bubbles could be estimated It explains how redox radicals are produced and how to make use of both the physical and chemical forces

generated during cavitation for various applications Intended for academic researchers industry professionals as well as undergraduate and graduate students especially those starting on a new research topic or those new to the field it provides a clear understanding of the concepts and methodologies involved in ultrasonic and sonochemistry Sonochemistry Suresh C. Ameta,Rakshit Ameta,Garima Ameta,2018 Traditionally heat and light are thought as energy sources to drive a particular chemical reaction but now ultrasound is a promising energy source for this purpose The collapse of a bubble generates a wide range of high temperatures and pressures and therefore use of ultrasound has a considerable potential in chemical and allied sciences Ultrasound assisted reactions are green and economically viable alternatives to conventional techniques This new volume presents a complete picture of ultrasound assisted reactions and technologies that can be used in organic synthesis polymer synthesis and degradation nanomaterials wastewater treatment food ingredients and products pharmaceutical applications bioenergy applications and more This volume aims to shed light on the diversified applications of ultrasound and its significant role as a green chemical pathway Sonochemistry deals with the effect of ultrasonic waves on chemical systems It has green value because of non hazardous acoustic radiation and is therefore duly recognized as a green chemistry by synthetic chemists as well as environmentalists There is no direct interaction of ultrasound with molecular species but the observed chemical and physical effects of ultrasound are due to the cavitation collapse which produces drastic conditions of temperature and pressure locally It induces the formation of various chemical species which cannot be easily attained under conventional conditions Sometimes these species are responsible for driving towards an unusual reactivity in molecular entities This book Sonochemistry An Emerging Green Technology provides the complete development of sonochemistry starting with an introduction and basic concepts of sonochemistry and proceeding on to different types of sonochemical reactions instrumentation use of ultrasound in driving particular chemical reactions and its applications in various fields such as polymer synthesis decontamination of water and wastewater preparation of nanomaterials food technology pharmaceutical sciences etc The book also briefly discusses some areas that utilize ultrasounds of different frequencies These include food products and their processing anaerobic digestion of waste and medical applications such as ultrasonography sonodynamic therapy drug delivery etc Sonochemistry will be successfully used on an industrial scale in pharmaceutical drugs polymers nanomaterials food technology material science biogas production etc in years to come and will be an established green chemical technology of the future Provided by publisher **Ultrasound in Synthesis** Steven V. Ley,Caroline M.R. Low,2012-12-06 The effects of heat and light on chemical reactions have long been known and understood Ultrasound has been known to promote chemical reactions for the past 60 years but despite this it did not attract the attention of synthetic chemists until recently This arose historically from early studies which concentrated almost exclusively on reactions in aqueous media and was also in some measure due to the availability of suitable technology Since the early 1980s a plethora of literature has appeared of direct interest to synthetic chemists and the field has been developing rapidly

The aim of this book is to bring the background of this fascinating field to the attention of a wider audience. It explores the literature to date and attempts to indicate other areas in which ultrasound may be exploited. It also hopes to explode some of the myths surrounding this area which have hitherto been regarded by the synthetic community as a bit of a black art. Existing books and reviews have tended to concentrate on the physics of sonochemistry and to catalogue the instances in which ultrasound has proved useful in tackling synthetic problems. Our aim has been to stress the relevance of this technique to synthetic chemists and we have included a section which deals with the practical aspects of carrying out these reactions.

Sonochemistry Navnath Hatvate, Hemantkumar N. Akolkar, A. K. Haghi, 2025-07-21. The study of the effects of ultrasound waves on a chemical reaction is known as sonochemistry. Ultrasound radiation between 20 kHz and 2 MHz is used to drive chemical and physical processes in solution. When ultrasound waves pass through liquid they generate tiny bubbles that expand and then collapse quickly. This process releases energy which can speed up the chemical reactions. Sonochemistry is considered a sustainable technology because it often utilizes less energy, requires fewer toxic chemicals and generates less waste compared to traditional chemical processes. Ultrasound waves are utilized in various processes including synthesis, crystallization and purifications and find applications in various sectors like pharmaceuticals, material sciences, agriculture, food processing and environment science. This book is focused on applications of sonochemistry. It begins by explaining the basics of the technology and moves on to describing applications in the fields of chemistry, chemical engineering and environmental engineering and discussed applications currently being developed and future outlook.

Ultrasound in Chemistry José-Luis Capelo-Martínez, 2009-01-07. This comprehensive reference and handbook covers all aspects of ultrasound for analytical applications. Besides classical extraction techniques it also provides an overview of ultrasound applications and devotes two chapters to proteomics and polymer technology. From the contents: Common ultrasonic devices, Elemental speciation, On line applications, Accelerated extraction of semivolatile and volatile organics, The ultrasonic bath vs the ultrasonic probe, Liquid liquid liquid solid and solid liquid extraction, Solid phase micro extraction, Stir bar sorptive extraction, Sonochemistry for organic and inorganic synthesis, Electrochemical applications, Applications to polymer science, Power ultrasound meets proteomics. Of great interest to researchers in academia and industry as well as analytical and natural products chemists and those working in trace analysis.

Ultrasound Technologies for Food and Bioprocessing Hao Feng, Gustavo Barbosa-Canovas, Jochen Weiss, 2010-11-17. Traditional food and bioprocessing technologies are facing challenges due to high expectation from the consumers and producers for better quality and safety, higher process efficiency and products with novel properties or functionalities. For this reason in the last few years new forms of physical energies have been explored to propose alternatives to traditional processing technologies. Acoustic energy has the potential to replace or partially substitute conventional processes and at the same time offer unique opportunities in the characterization of foods and biomaterials. This book is a resource for experts and newcomers in the field of power ultrasound.

gives insights into the physical principles of this technology details the latest advancements and links them to current and potential applications in the food and bioprocessing related industries

Unveiling the Power of Verbal Art: An Emotional Sojourn through **Ultrasound Technology In Green Chemistry Springerbriefs In Molecular Science**

In some sort of inundated with screens and the cacophony of instant transmission, the profound power and psychological resonance of verbal beauty often fade into obscurity, eclipsed by the continuous onslaught of noise and distractions. Yet, situated within the lyrical pages of **Ultrasound Technology In Green Chemistry Springerbriefs In Molecular Science**, a charming function of fictional splendor that pulses with raw thoughts, lies an unforgettable trip waiting to be embarked upon. Composed by way of a virtuoso wordsmith, this enchanting opus guides readers on an emotional odyssey, lightly exposing the latent potential and profound impact embedded within the intricate internet of language. Within the heart-wrenching expanse of the evocative examination, we can embark upon an introspective exploration of the book is central styles, dissect its interesting writing design, and immerse ourselves in the indelible effect it leaves upon the depths of readers souls.

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