

RSC Green Chemistry Series

Edited by Vivek Polshettiwar and Rajender S. Varma

Aqueous Microwave Assisted Chemistry

Synthesis and Catalysis



RSC Publishing

Aqueous Microwave Assisted Chemistry Synthesis And Catalysis Rsc Green Chemistry

**Teresa M. V. D. Pinho e Melo, Marta
Pineiro**



Aqueous Microwave Assisted Chemistry Synthesis And Catalysis Rsc Green Chemistry:

Aqueous Microwave Assisted Chemistry Vivek Polshettiwar, Rajender S Varma, 2010-05-20 The demands for green and sustainable synthetic methods in the fields of healthcare and fine chemicals combined with the pressure to produce these substances expeditiously and in an environmentally benign fashion pose significant challenges to the synthetic chemical community Green chemistry can avoid pollution by utilizing techniques that are environmentally friendly by design and one of the best green techniques is the use of microwave MW assisted aqueous synthetic protocols Fusing MW technique with water as a benign reaction medium can offer an extraordinary synergistic effect with greater potential than these two individual components in isolation Selective microwave heating can be exploited to develop a high yield protocol and the use of water expedites the MW protocol with more energy efficiency This book provides an overview of the various processes developed using aqueous microwave chemistry and is written for chemists chemical engineers and researchers in the early stages who want to develop sustainable and green processes Written by well known microwave experts the book is a comprehensive examination of the field and is the first book that deals strictly with aqueous microwave chemistry and represents a significant effort towards green chemistry It covers all the microwave assisted aqueous reactions in depth including heterocycle synthesis metal catalysis enzyme catalysis polymer synthesis nanomaterials synthesis and nano catalysis Each chapter contains representative experimental procedures helping the reader quickly replicate some of the experiments to gain hands on experience

Aqueous Microwave Assisted Chemistry Vivek Polshettiwar, Rajender S. Varma, 2010 The demands for green and sustainable synthetic methods in the fields of healthcare and fine chemicals combined with the pressure to produce these substances expeditiously and in an environmentally benign fashion pose significant challenges to the synthetic chemical community Green chemistry can avoid pollution by utilizing techniques that are environmentally friendly by design and one of the best green techniques is the use of microwave MW assisted aqueous synthetic protocols Fusing MW technique with water as a benign reaction medium can offer an extraordinary synergistic effect with greater potential than these two individual components in isolation Selective microwave heating can be exploited to develop a high yield protocol and the use of water expedites the MW protocol with more energy efficiency This book provides an overview of the various processes developed using aqueous microwave chemistry and is written for chemists chemical engineers and researchers in the early stages who want to develop sustainable and green processes Written by well known microwave experts the book is a comprehensive examination of the field and is the first book that deals strictly with aqueous microwave chemistry and represents a significant effort towards green chemistry It covers all the microwave assisted aqueous reactions in depth including heterocycle synthesis metal catalysis enzyme catalysis polymer synthesis nanomaterials synthesis and nano catalysis Each chapter contains representative experimental procedures helping the reader quickly replicate some of the experiments to gain hands on experience

Green Chemistry for Environmental

Remediation Rashmi Sanghi,Vandana Singh,2012-01-20 The book explains the importance of chemistry in solving environmental issues by highlighting the role green chemistry plays in making the environment clean and green by covering a wide array of topics ranging from sustainable development microwave chemical reaction renewable feedstocks microbial bioremediation and other topics that when implemented will advance environmental improvement Green Chemistry for Environmental Remediation provides insight on how educators from around the world have incorporated green chemistry into their classrooms and how the principles of green chemistry can be integrated into the curriculum The volume presents high quality research papers as well as in depth review articles from eminent professors scientists chemists and engineers both from educational institutions and from industry It introduces a new emerging green face of multidimensional environmental chemistry Each chapter brings forward the latest literature and research being done in the related area The 23 chapters are divided into 4 sections Green chemistry and societal sustainability including teaching and education of green chemistry Green lab technologies and alternative solutions to conventional laboratory techniques Green bio energy sources as green technology frontiers Green applications and solutions for remediation Green Chemistry for Environmental Remediation is an important resource for academic researchers students faculty industrial chemists chemical engineers environmentalists and anyone interested in environmental policy safeguarding the environment Relevant industries include those in clean technology renewable energy biotechnology pharmaceutical and chemicals Another goal of the book is to promote and generate awareness about the relationship of green chemistry with the environment amongst the younger generation who might wish to pursue a career in green chemistry **Microwaves in Organic and Medicinal Chemistry**

C. Oliver Kappe,Alexander Stadler,Doris Dallinger,2013-03-19 Tailored to the needs of medicinal and natural products chemists the second edition of this unique handbook brings the contents up to speed almost doubling the amount of chemical information with an additional volume As in the predecessor a short introductory section covers the theoretical background and evaluates currently available instrumentation and equipment The main part of the book then goes on to systematically survey the complete range of published microwave assisted synthesis methods from their beginnings in the 1990s to mid 2011 drawing on data from more than 5 000 reports and publications Throughout the focus is on those reactions reagents and reaction conditions that work and that are the most relevant for medicinal and natural products chemistry A much expanded section is devoted to combinatorial highthroughput and flow chemistry methods Microwave-Assisted

Polymerization Anuradha Mishra,Tanvi Vats,James H. Clark,2016 This book will be a valuable resource for polymer scientists and engineers who want to develop sustainable processes using microwave assisted techniques **Heterogeneous Catalysts for Clean Technology** Karen Wilson,Adam F. Lee,2013-09-17 Reactive but not a reactant Heterogeneous catalysts play an unseen role in many of today s processes and products With the increasing emphasis on sustainability in both products and processes this handbook is the first to combine the hot topics of heterogeneous catalysis and clean

technology It focuses on the development of heterogeneous catalysts for use in clean chemical synthesis dealing with how modern spectroscopic techniques can aid the design of catalysts for use in liquid phase reactions their application in industrially important chemistries including selective oxidation hydrogenation solid acid and base catalyzed processes as well as the role of process intensification and use of renewable resources in improving the sustainability of chemical processes With its emphasis on applications this book is of high interest to those working in the industry Green Approaches in Medicinal Chemistry for Sustainable Drug Design Bimal Banik, 2024-06-01 Extensive experimentation and high failure rates are a well recognised downside to the drug discovery process with the resultant high levels of inefficiency and waste producing a negative environmental impact Sustainable and Green Approaches in Medicinal Chemistry Second Edition reveals how medicinal chemistry can play a direct role in addressing this issue After providing essential context to the growth of green chemistry in relation to drug discovery the book goes on to identify a broad range of practical techniques and useful insights revealing how medicinal chemistry techniques can be used to improve efficiency mitigate failure and increase the environmental benignity of the entire drug discovery process Drawing on the knowledge of a global team of experts Sustainable and Green Approaches in Medicinal Chemistry 2e encourages the growth of green medicinal chemistry and supports medicinal chemists drug discovery researchers pharmacologists and all those in related fields across both academia and industry in integrating these approaches into their own work This first volume of the second edition covers synthesis methods following green chemistry principles contributing to sustainability by saving energy using lesser toxic reagents solvents catalysts and environmentally benign sources including plants and agricultural materials Highlights the need for the adoption of sustainable and green chemistry pathways in drug development Reveals risk factors associated with the drug development process and the ways sustainable approaches can help address these factors Identifies novel and cost effective green medicinal chemistry approaches for improved efficiency and sustainability Greener Synthesis of Organic Compounds Ahindra Nag, 2022-05-30 This book provides an interdisciplinary integrative overview of environmental problem solving using mild reaction conditions green reagents waste free and energy efficient synthesis in both industry and academic world Discussions include a broad integrated perspective on sustainability integrated risk multi scale changes and impacts taking place within ecosystems worldwide Features This book serves as a reference book for scientific investigators who need to do greener synthesis of organic compounds drugs and natural products under mild reaction condition using green reagents eco friendly catalysts and benign reaction mediums over traditional synthetic processes which is a key driving force of scientists Greener synthesis of multiple value added heterocycles opens up a new horizon towards the organic catalysis and for this purpose development of natural resources acts as an effective catalyst Using environmentally friendly reaction medium e g ACC WETSA WEBSA have been used for the synthesis of some crucial heterocyclic scaffolds such as bisenols and 2 amino 4H pyrans tetraketones pyrans and biaryls This book can also be used as a textbook for graduate and

post graduate level courses for students Furthermore the problems with answers in book will add better understanding for students

Advances in Green Synthesis Inamuddin,Rajender Boddula,Mohd Imran Ahamed,Anish Khan,2021-05-18 This edited book focusses on green chemistry as the research community endeavours to create eco friendly materials and technologies It provides an in depth overview of the fundamentals key concepts and experimental techniques for eco friendly synthesis of organic compounds and metal metal oxide nanoparticles nanomaterials It also emphasizes the mechanisms designing and industrial technologies for green synthesis and its applications Each chapter brings the recent developments state of the art challenges and perspectives which cover all the aspects in one place and which concern the green synthesis and evolution Authored by world renowned experts in a broad range of green chemistry sectors this book is an archival reference guide for researchers engineers scientists and postgraduates working in the field of sustainable science green chemistry environmental science engineering sciences and industrial technologies

Bioactive Five-Membered Heterocycles Asit K. Chakraborti,Bubun Banerjee,2025-04-21 Bioactive Five Membered Heterocycles provides detailed information on the green synthesis of the structurally diverse pharmaceutically active five membered heterocycles It covers both synthesis and biological aspects and highlights the role of five membered heterocycles in drugs and drug designing It also includes naturally occurring bioactive five membered heterocycles

Solvents - Dilute, Dissolve, and Disperse - Insights on Green Solvents and Distillation Raffaello Papadakis,Vilmar Steffen,2024-08-21 The book Solvents Dilute Dissolve and Disperse Insights on Green Solvents and Distillation takes the reader on a journey of chemistry and engineering toward sustainability The book unravels the potential of green solvents which are remarkably versatile low toxicity alternatives to traditional solvents that promise to reduce environmental impact Latest research on supercritical fluids ionic liquids and deep eutectic solvents are carefully reviewed with emphasis on the numerous applications of green solvents Additionally as industrial demands evolve the development of existing techniques is necessary Distillation the cornerstone of industrial separation has been reimaged through groundbreaking approaches allowing for reduced operational costs and a diminished environmental footprint The novel approaches in distillation offer advancement allowing us to tackle the complexities of separating complex mixtures with unprecedented precision Acknowledging these facts this book covers new trends in this exciting research field of science and engineering The book is an essential read for chemists engineers environmentalists and anyone committed to fostering innovation for a greener tomorrow

Green Chemistry Approaches to Environmental Sustainability Vinod Kumar Garg,Anoop Yadav,Chandra Mohan,Sushma Yadav,Neeraj Kumari,2023-09-20 Green Chemistry Approaches to Environmental Sustainability Status Challenges and Prospective provides a comprehensive and complete overview of the emerging discipline of green chemistry and fundamental chemical principles The book bridges the gap between research and industry by offering a systematic overview of current available sustainable materials and related information on new materials suitability and potential for given projects Along the way the book examines natural and

biodegradable materials while also presenting materials with multifunctional properties Topics addressed in this book will be major accomplishments for sustainable developments in biofuels renewable energies and in the remediation of pollutants in water air and soil Encompasses all aspects of green chemistry through an interdisciplinary approach Addresses major accomplishments for sustainable development Presents green chemistry as a philosophical approach whereby its core principle can attribute towards sustainable developments

Milestones in Microwave Chemistry György

Keglevich,2016-03-22 This book looks back on thirty five years of microwave MW chemistry and explains how the application of the MW technique became an integral part of R it also explains why in most cases the reactions can be performed under solvent free conditions MW irradiation within the sphere of organophosphorus chemistry is showcased and typical reactions such as the direct derivatization of phosphinic acids alkylating esterifications Diels Alder reactions the inverse Wittig type reaction fragmentations the Arbuzov reaction the synthesis of hydroxyphosphonates and aminophosphonates the Kabachnik Fields condensation deoxygenations and P C coupling reactions are described under MW conditions In closing the advantages of MW chemistry such as faster reactions and the possibility of simplifying the catalytic systems are addressed

Microwave Chemical and Materials Processing Satoshi Horikoshi, José M. Catalá-Civera, Robert F. Schiffmann, Jun

Fukushima, Tomohiko Mitani, Nick Serpone, 2024-10-24 This book adds remarkable advances in microwave chemistry methods equipment and practical examples since the first edition was published in 2018 Moreover practical examples of the use of microwave energy have been upgraded It also includes how to easily predict microwave heating using material constants In addition coupling analysis simulation with electromagnetic fields and heat transfer which greatly support researchers experiments is covered The principal aim of this book hasn t changed to introduce chemists through a tutorial approach to the use of microwaves by examining several experiments of microwave chemistry and materials processing It subsequently enables chemists to fashion their own experiments in microwave chemistry or materials processing This book helps chemists who take an interest in the use of microwave radiation to overcome difficulties to understand the nature of electromagnetism microwave engineering and thermodynamics

Industrial Applications Rajender S. Varma, Bubun Banerjee, 2022-05-09

Magnetic nanocatalysts are garnering attention for development of greener catalytic processes due to their ease of recovery from a reaction medium This book delves into a variety of magnetic nanocatalysts their use in the industrial context and recyclability Topics covered include wastewater treatment drug delivery and industrial catalysis another available volume focuses on the use of magnetic nanocatalysts in synthetic appliances and transformations

Green Analytical Chemistry

Justyna Płotka-Wasyłka, Jacek Namieśnik, 2019-08-02 The book explains the principles and fundamentals of Green Analytical Chemistry GAC and highlights the current developments and future potential of the analytical green chemistry oriented applications of various solutions The book consists of sixteen chapters including the history and milestones of GAC issues related to teaching of green analytical chemistry and greening the university laboratories evaluation of impact of analytical

activities on the environmental and human health direct techniques of detection identification and determination of trace constituents new achievements in the field of extraction of trace analytes from samples characterized by complex composition of the matrix green nature of the derivatization process in analytical chemistry passive techniques of sampling of analytes green sorption materials used in analytical procedures new types of solvents in the field of analytical chemistry In addition green chromatography and related techniques fast tests for assessment of the wide spectrum of pollutants in the different types of the medium remote monitoring of environmental pollutants qualitative and comparative evaluation quantitative assessment and future trends and perspectives are discussed This book appeals to a wide readership of the academic and industrial researchers In addition it can be used in the classroom for undergraduate and graduate Ph D students focusing on elaboration of new analytical procedures for organic and inorganic compounds determination in different kinds of samples characterized by complex matrices composition Jacek Namie niki was a Professor at the Department of Analytical Chemistry Gda sk University of Technology Poland Justyna P otka Wasy lka is a teacher and researcher at the same department

Heterocycles Teresa M. V. D. Pinho e Melo, Marta Pineiro, 2022-06-21 *Heterocycles* A must read handbook on heterocycle chemistry with a focus on sustainability Heterocycles feature prominently in our daily life they are essential for pharmaceuticals agrochemicals and fine chemicals More numerous natural bioactive products contain heterocyclic compounds As a result heterocyclic chemistry continues to be one of the most important areas of study in organic chemistry Heterocycles provides an important reference on a wide range of topics relating to heterocyclic chemistry with a heavy emphasis on sustainable methods and greener syntheses The book describes state of the art synthetic methods such as photochemical reactions dearomatization reactions organocatalysis transition metal catalysis and biocatalysis It also covers Sustainable methods like flow chemistry mechanochemistry and multicomponent synthesis Strategies for the synthesis of heterocyclic macrocycles and medium sized rings Characterization of heterocyclic compounds Heterocycles is a useful reference for organic chemists natural products chemists catalytic chemists and medicinal chemists in academia and industry

Handbook of Ionic Liquids Sanchayita Rajkhowa, Pardeep Singh, Anik Sen, Jyotirmoy Sarma, 2024-01-03 *Handbook of Ionic Liquids* A one stop reference for researchers interested in ionic liquids and their applications *Handbook of Ionic Liquids* Fundamentals Applications and Sustainability constitutes an overview of the latest advances in ionic liquid chemistry It offers a comprehensive summary of the development history of ionic liquids their design and the diverse array of applications including green and sustainable synthesis catalysis drug development and medicine biotechnology materials science and electrochemistry The authors explain a variety of processes used to develop novel materials with ionic liquids and describe likely future developments using practical examples taken from contemporary research and development in the field The book includes discussions of biomass conversion CO₂ capture and more You ll also discover A thorough introduction to the theory of ionic liquids as well as their different types and recycling methods Comprehensive explorations of the physico

chemical properties of ionic liquids Practical discussions of ionic liquid synthesis and analysis including green synthesis and heterocyclic chemistry applications Summary of the use of ionic liquids in materials science including polymers energy conversion and storage devices Perfect for organic catalytic physical analytical and environmental chemists Handbook of Ionic Liquids Fundamentals Applications and Sustainability will also benefit electrochemists materials scientists and biotechnologists with an interest in ionic liquids and their application

Encyclopedia of Green Materials Chinnappan Baskar, Seeram Ramakrishna, Angela Daniela La Rosa, 2024-12-26 Encyclopedia of Green Materials covers comprehensive overview recent research and development of Green Materials and Green Nanomaterials and their applications in all areas including electronics sensors textiles biomedical energy and energy storage building constructions and interiors design automotive green plastic manufacturing food packing membrane technology wastewater treatment rubber technology and tire manufacturing The contents focus on sustainable development renewable circular economy Chemistry 4 0 Chemistry through innovation in transforming the world green chemistry and green engineering upcycling and recycling

Sustainable Nanotechnology Yashwant V. Pathak, Govindan Parayil, Jayvadan K. Patel, 2022-03-29 Sustainable Nanotechnology A robust examination of the use of nanotechnology in the manufacture of sustainable products In Sustainable Nanotechnology Strategies Products and Applications a team of distinguished researchers delivers a comprehensive and up to date exploration of nanotechnology applications in environmental pharmaceutical and engineering products in the context of global sustainability The book offers balanced coverage of the benefits and risks of nanotechnology Divided into three parts the editors have included contributions from leading scholars discussing sustainability toxicological impacts and nanomaterial based adsorbents This edited volume helps readers understand how nanotechnology and nanomaterials apply in different global sustainability challenges It also discusses models for understanding the lifecycle and risk assessments of manufactured nanomaterials Case studies are included to explore such topics as design remediation and technology assessment The book also provides Thorough introductions to nanotechnology based research priorities for global sustainability and the challenges and opportunities of modern sustainable nanotechnology Comprehensive explorations of improving the sustainability of bio based products with nanotechnology and the improvement of the environmental sustainability of biopolymers using nanotechnology Practical discussions of nanotechnology based polymers for drug delivery applications In depth examinations of green nanotechnology driven drug delivery systems Perfect for nanotechnology focused professionals sustainability experts biomedical experts and pharmaceutical industry practitioners Sustainable Nanotechnology Strategies Products and Applications will also earn a place in the libraries of neuroscientists bioengineering professionals and those involved in neuroprosthetic engineering

The book delves into Aqueous Microwave Assisted Chemistry Synthesis And Catalysis Rsc Green Chemistry. Aqueous Microwave Assisted Chemistry Synthesis And Catalysis Rsc Green Chemistry is a crucial topic that must be grasped by everyone, from students and scholars to the general public. The book will furnish comprehensive and in-depth insights into Aqueous Microwave Assisted Chemistry Synthesis And Catalysis Rsc Green Chemistry, encompassing both the fundamentals and more intricate discussions.

1. This book is structured into several chapters, namely:
 - Chapter 1: Introduction to Aqueous Microwave Assisted Chemistry Synthesis And Catalysis Rsc Green Chemistry
 - Chapter 2: Essential Elements of Aqueous Microwave Assisted Chemistry Synthesis And Catalysis Rsc Green Chemistry
 - Chapter 3: Aqueous Microwave Assisted Chemistry Synthesis And Catalysis Rsc Green Chemistry in Everyday Life
 - Chapter 4: Aqueous Microwave Assisted Chemistry Synthesis And Catalysis Rsc Green Chemistry in Specific Contexts
 - Chapter 5: Conclusion
2. In chapter 1, this book will provide an overview of Aqueous Microwave Assisted Chemistry Synthesis And Catalysis Rsc Green Chemistry. The first chapter will explore what Aqueous Microwave Assisted Chemistry Synthesis And Catalysis Rsc Green Chemistry is, why Aqueous Microwave Assisted Chemistry Synthesis And Catalysis Rsc Green Chemistry is vital, and how to effectively learn about Aqueous Microwave Assisted Chemistry Synthesis And Catalysis Rsc Green Chemistry.
3. In chapter 2, the author will delve into the foundational concepts of Aqueous Microwave Assisted Chemistry Synthesis And Catalysis Rsc Green Chemistry. This chapter will elucidate the essential principles that must be understood to grasp Aqueous Microwave Assisted Chemistry Synthesis And Catalysis Rsc Green Chemistry in its entirety.
4. In chapter 3, the author will examine the practical applications of Aqueous Microwave Assisted Chemistry Synthesis And Catalysis Rsc Green Chemistry in daily life. The third chapter will showcase real-world examples of how Aqueous Microwave Assisted Chemistry Synthesis And Catalysis Rsc Green Chemistry can be effectively utilized in everyday scenarios.
5. In chapter 4, the author will scrutinize the relevance of Aqueous Microwave Assisted Chemistry Synthesis And Catalysis Rsc Green Chemistry in specific contexts. The fourth chapter will explore how Aqueous Microwave Assisted Chemistry Synthesis And Catalysis Rsc Green Chemistry is applied in specialized fields, such as education, business, and technology.
6. In chapter 5, this book will draw a conclusion about Aqueous Microwave Assisted Chemistry Synthesis And Catalysis Rsc Green Chemistry. The final chapter will summarize the key points that have been discussed throughout the book. This book is crafted in an easy-to-understand language and is complemented by engaging illustrations. It is highly recommended for anyone seeking to gain a comprehensive understanding of Aqueous Microwave Assisted Chemistry Synthesis And Catalysis Rsc Green Chemistry.

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