

Edited by René Peters

Cooperative Catalysis

Designing Efficient Catalysts for Synthesis



Cooperative Catalysis Designing Efficient Catalysts For Synthesis

Bruce A. Arndtsen, Liu-Zhu Gong



Cooperative Catalysis Designing Efficient Catalysts For Synthesis:

Cooperative Catalysis René Peters, 2015 **Cooperative Catalysis** René Peters, 2015-01-30 Written by experts in the field this is a much needed overview of the rapidly emerging field of cooperative catalysis The authors focus on the design and development of novel high performance catalysts for applications in organic synthesis particularly asymmetric synthesis covering a broad range of topics from the latest progress in Lewis acid Brønsted base catalysis to e.g. metal assisted organo catalysis cooperative metal enzyme catalysis and cooperative catalysis in polymerization reactions and on solid surfaces The chapters are classified according to the type of cooperating activating groups and describe in detail the different strategies of cooperative activation highlighting their respective advantages and pitfalls As a result readers will learn about the different concepts of cooperative catalysis their corresponding modes of operation and their applications thus helping to find a solution to a specific synthetic catalysis problem **Homo- and Heterobimetallic Complexes in Catalysis** Philippe

Kalck, 2016-06-14 The series Topics in Organometallic Chemistry presents critical overviews of research results in organometallic chemistry As our understanding of organometallic structure properties and mechanisms increases new ways are opened for the design of organometallic compounds and reactions tailored to the needs of such diverse areas as organic synthesis medical research biology and materials science Thus the scope of coverage includes a broad range of topics of pure and applied organometallic chemistry where new breakthroughs are being achieved that are of significance to a larger scientific audience The individual volumes of Topics in Organometallic Chemistry are thematic Review articles are generally invited by the volume editors All chapters from Topics in Organometallic Chemistry are published OnlineFirst with an individual DOI In references Topics in Organometallic Chemistry is abbreviated as Top Organomet Chem and cited as a journal Science of Synthesis: Dual Catalysis in Organic Synthesis 2 G. A. Molander, 2020-05-22 The field of dual catalysis

has developed rapidly over the last decade and these volumes define its impact on organic synthesis The most important basic concepts of synergistic dual catalytic cycles are introduced providing newcomers to the field with reliable information on this new approach to facilitating the synthesis of organic molecules Background information and reliable procedures for challenging transformations in synthesis are presented applying the concept of cooperative dual catalysis as a means of increasing molecular complexity in the most efficient manner The most useful practical and reliable methods for dual catalysis combining metal catalysts organocatalysts photocatalysts and biocatalysts are presented **Pharmaceutical**

Biocatalysis Peter Grunwald, 2019-11-07 This volume provides an insight into the future strategies for commercial biocatalysis with a focus on sustainable technologies together with chemoenzymatic and biotechnological approaches to synthesize various types of approved and new active pharmaceutical ingredients APIs via proven and latest synthetic routes using single step biocatalytic or enzyme cascade reactions Many of these drugs act as enzyme inhibitors as discussed in a chapter with a variety of examples The targeted enzymes are involved in diseases such as different cancers metastatic and

infectious diseases osteoporosis and cardiovascular disorders The biocatalysts employed for API synthesis include hydrolytic enzymes alcohol dehydrogenases laccases imine reductases reductive aminases peroxygenases cytochrome P450 enzymes polyketide synthases transaminases and halogenases Many of them have been improved with respect to their properties by engineering methods The book discusses the syntheses of drugs including alkaloids and antibiotics non ribosomal peptides antimalarial and antidiabetic drugs prenylated xanthenes antioxidants and many important chiral intermediates required for the synthesis of pharmaceuticals **Asymmetric Organocatalysis Combined with Metal Catalysis** Bruce A.

Arndtsen, Liu-Zhu Gong, 2020-04-24 The series Topics in Current Chemistry Collections presents critical reviews from the journal Topics in Current Chemistry organized in topical volumes The scope of coverage is all areas of chemical science including the interfaces with related disciplines such as biology medicine and materials science The goal of each thematic volume is to give the non specialist reader whether in academia or industry a comprehensive insight into an area where new research is emerging which is of interest to a larger scientific audience Each review within the volume critically surveys one aspect of that topic and places it within the context of the volume as a whole The most significant developments of the last 5 to 10 years are presented using selected examples to illustrate the principles discussed The coverage is not intended to be an exhaustive summary of the field or include large quantities of data but should rather be conceptual concentrating on the methodological thinking that will allow the non specialist reader to understand the information presented Contributions also offer an outlook on potential future developments in the field The chapter Enamine Transition Metal Combined Catalysis Catalytic Transformations Involving Organometallic Electrophilic Intermediates is available open access under a CC BY 4.0 License via link.springer.com **Chemical Photocatalysis** Burkhard König, 2020-04-06 Visible light is an abundant source of energy While the conversion of light energy into electrical energy photovoltaics is highly developed and commercialized the use of visible light in chemical synthesis is far less explored Chemical photocatalysts that mimic principles of biological

photosynthesis utilize visible light to drive endothermic or kinetically hindered reactions **Synthesis And Applications**

In Chemistry And Materials (In 4 Volumes) Armando J L Pombeiro, Kamran T Mahmudov, Maria De Fatima Costa Guedes Da Silva, 2024-01-16 **Homogeneous Hydrogenation with Non-Precious Catalysts** Johannes F. Teichert, 2019-10-22 A

guide and comprehensive review of the most recent advances in homogeneous hydrogenation with non precious catalysts In recent years a great deal of research has been applied to homogeneous hydrogenation with non precious catalysis

Homogeneous Hydrogenation with Non Precious Catalysts offers a review of the latest developments and advances in the field In addition the book explores the transition metal catalysis and the concept of frustrated lewis pair FLP and enzymatic processes The editor a noted expert on the topic discusses the various catalysts and puts the focus on the synthetic vantage point highlighting the functional group transformation enabled by the respective catalyst Homogeneous Hydrogenation with Non Precious Catalysts also presents the industrial view of the topic and includes an overview of the various catalysts by

functional group transformations This important book Offers a comprehensive presentation of the newest development in this emerging field Highlights the transition metal catalysis the frustrated lewis pair FLP concept and enzymatic processes Provides an industrial perspective of the topic Includes an overview of the various catalysis by functional group transformations Written for organic chemists researchers in synthetic chemistry and industry professionals Homogeneous Hydrogenation with Non Precious Catalysts offers a comprehensive and accessible guide to the most recent advances in the field COPY_WEB_CATALOG

Non-Noble Metal Catalysis Robertus J. M. Klein Gebbink, Marc-Etienne Moret, 2018-12-31 An expert overview of current research applications and economic and environmental advantages The study and development of new homogeneous catalysts based on first row metals Mn Fe Co Ni and Cu has grown significantly due to the economic and environmental advantages that non noble metals present Base metals offer reduced cost greater supply and lower toxicity levels than noble metals enabling greater opportunity for scientific investigation and increased development of practical applications Non Noble Metal Catalysis provides an authoritative survey of the field from fundamental concepts and computational methods to industrial applications and reaction classes Recognized experts in organometallic chemistry and homogeneous catalysis the authors present a comprehensive overview of the conceptual and practical aspects of non noble metal catalysts Examination of topics including non innocent ligands proton coupled electron transfer and multi nuclear complexes provide essential background information while areas such as kinetic lability and lifetimes of intermediates reflect current research and shifting trends in the field This timely book demonstrates the efficacy of base metal catalysts in the pharmaceutical fine chemical and agrochemical industries addressing both environmental and economic concerns Providing essential conceptual and practical exploration this valuable resource Illustrates how unravelling new reactivity patterns can lead to new catalysts and new applications Highlights the multiple advantages of using non noble metals in homogenous catalysis Demonstrates how the availability of non noble metal catalysis reduces costs and leads to immense savings for the chemical industry Reveals how non noble metal catalysis are more sustainable than noble metals such as palladium or platinum Non Noble Metal Catalysis Molecular Approaches and Reactions is an indispensable source of up to date information for catalytic chemists organic chemists industrial chemists organometallic chemists and those seeking to broaden their knowledge of catalytic chemistry

Frustrated Lewis Pairs J. Chris Slootweg, Andrew R. Jupp, 2020-11-22 This volume highlights the latest research in frustrated Lewis pair FLP chemistry and its applications The contributions present the recent developments of the use of FLPs in asymmetric catalysis polymer synthesis homogeneous and heterogeneous catalysis as well as demonstrating their use as a pedagogical tool The book will be of interest to researchers in academia and industry alike

Chiral Lewis Acids Koichi Mikami, 2018-02-19 The series Topics in Organometallic Chemistry presents critical overviews of research results in organometallic chemistry As our understanding of organometallic structure properties and mechanisms increases new ways are opened for the design of organometallic compounds and reactions

tailored to the needs of such diverse areas as organic synthesis medical research biology and materials science Thus the scope of coverage includes a broad range of topics of pure and applied organometallic chemistry where new breakthroughs are being achieved that are of significance to a larger scientific audience The individual volumes of Topics in Organometallic Chemistry are thematic Review articles are generally invited by the volume editors All chapters from Topics in Organometallic Chemistry are published OnlineFirst with an individual DOI In references Topics in Organometallic Chemistry is abbreviated as Top Organomet Chem and cited as a journal

Design and Applications of Hydroxyapatite-Based Catalysts Doan Pham Minh, 2022-06-15 Essential reference for researchers and experts in industry highlighting the rapidly growing field of hydroxyapatite based catalysts and their application in various chemical processes Hydroxyapatite $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$ is the main mineral component of human and animal bones It is largely applied in the field of biomaterials due to its biocompatibility Recently hydroxyapatite based materials have especially gained a lot of attention by researchers in catalysis as they are versatile and have shown precious properties of a good catalyst and catalyst support such as excellent ion exchange capacity high porosity very low water solubility controlled basicity acidity and good thermal stability at high temperatures Design and Applications of Hydroxyapatite Based Catalysts gives a detailed overview of the synthesis characterization and use of hydroxyapatite based materials in catalysis It covers synthetic hydroxyapatites from pure chemicals or waste natural apatites and materials from eggshells and animal bones The application of hydroxyapatite based catalysts in selective oxidation deoxygenation selective hydrogenation dehydrogenation reactions organic synthesis as well as reforming processes and production of energy carriers is reviewed Moreover electrocatalysis and photocatalysis using hydroxyapatite based materials are discussed Kinetic and mechanism studies of various chemical processes over hydroxyapatite based catalysts are also presented This is the first book solely dedicated to hydroxyapatite based materials and their use in catalysis Covers synthesis and characterization surface and structure studies kinetic and mechanism aspects and various applications in heterogeneous catalysis electrocatalysis and photocatalysis Aimed at further stimulating research in the field Design and Applications of Hydroxyapatite Based Catalysts is an indispensable source of information for researchers in academia and industry working in catalysis

Design of Macrocyclic Compounds for Biomedical Applications Pavel Padnya, Xin Wu, Andrea Erxleben, Susana Santos Braga, 2021-09-13 Grundlagen der metallorganischen Komplexkatalyse Dirk Steinborn, 2019-05-29 Die Katalyse ist als grundlegendes Prinzip zur Überwindung der kinetischen Hemmung chemischer Reaktionen von fundamentaler Bedeutung in der Chemie und die metallorganische Komplexkatalyse ist ein Eckpfeiler der modernen Chemie Das trifft gleichermaßen für die Grundlagen und angewandte Forschung wie für industrielle Anwendungen zu Ausgehend von den Prinzipien der Katalyse und den katalytisch relevanten metallorganischen Elementarschritten werden wichtige metallkomplektkatalysierte Reaktionen behandelt wobei das mechanistische Verständnis im Vordergrund steht Besonderer Wert wird dabei auf aktuelle Entwicklungen gelegt

Asymmetrische Synthesen finden ausführlich Berücksichtigung und an ausgewählten Beispielen wird die katalytische Wirkung von Metalloenzymen aufgezeigt. Ausführungen zur Aktivierung von Kohlendioxid in der Komplexkatalyse schlagen eine Brücke zur aktuellen Diskussion über CO₂ als wichtigstes Treibhausgas. Am Beispiel der Stickstofffixierung werden die drei großen Gebiete der Katalyse, die homogene, die heterogene und die enzymatische Katalyse, vergleichend betrachtet. Der Inhalt: Geschichte und Grundlagen der Katalyse, Elementarreaktionen in der metallorganischen Komplexkatalyse, Hydrierung und Hydroformylierung von Olefinen, Carbonylierung von Methanol, Fischer-Tropsch-Synthese und CO-Konvertierung, Aktivierung von Kohlendioxid, Metathese von Olefinen, Alkinen und Alkanen, Oligomerisation und Polymerisation von Olefinen und Butadien, Palladiumkatalysierte C-C-Kupplungsreaktionen, Hydrocyanierungen, Silylierungen und Aminierungen von Olefinen, Oxidation von Olefinen und C-H-Funktionalisierungen von Alkanen, Stickstofffixierung. Die Zielgruppen: Studierende der Chemie im Vertiefungs-Masterstudium an Universitäten und Fachhochschulen, Diplomanden und Doktoranden, Chemiker in Forschung und Entwicklung. Der Autor: Prof. Dr. Dirk Steinborn, Martin-Luther-Universität Halle-Wittenberg.

Enantioselective Multicatalysed Tandem Reactions Hélène Pellissier, 2014-08-19. Chiral molecules are needed for the production of many pharmaceuticals and materials and catalytic asymmetric synthesis provides a method for the preparation of such chiral products. For the synthesis of complex molecules such as natural products and biologically active compounds more than one catalytic reaction may be necessary and tandem catalysis refers to the combination of catalytic reactions into one synthesis. By combining catalysts it enables a more efficient, economical and selective one-pot approach for complex molecule synthesis which could not be achieved through single specific catalytic systems. The challenge is finding the right catalyst which is compatible with other catalysts but also tolerates reagents, solvent and intermediates generated during the course of the reaction. Enantioselective Multicatalysed Tandem Reactions provides an overview of recent developments in the area. The first part of the book covers asymmetric tandem reactions catalysed by multiple catalysts from the same discipline: organocatalysts, two-metal and multi-enzyme catalysed reactions. The second part looks at tandem reactions catalysed by multiple catalysts from different disciplines, including reactions catalysed by a combination of metals and organocatalysts, reactions catalysed by a combination of metals and enzymes, and finally reactions catalysed by a combination of organocatalysts and enzymes. The book will appeal to researchers and professionals in academic and industrial laboratories interested in catalysis, biocatalysis and organic synthesis of chiral compounds.

Asymmetric Organo-Metal Catalysis Liu-Zhu Gong, 2022-03-14. Explore the latest advances involving organo-metal combined catalysts from leading contributors in the field. In Asymmetric Organo-Metal Catalysis: Concepts, Principles and Applications, accomplished chemist Liu-Zhu Gong delivers a comprehensive discussion of how to design efficient organo-metal combined catalyst systems, new cooperatively catalyzed asymmetric reactions, relay catalytic cascades and multicomponent reactions. The distinguished author covers critical topics like the combined catalysis of chiral phase transfer catalysts, enamine-iminium nucleophilic Lewis base or

Bronsted acids with metal complexes while also covering the cooperative catalysis of photocatalysts and organocatalysts The book offers readers an exploration of the general concepts and principles of bond activation and reorganization together with a comprehensive introduction to the historical developments and recent advances in the field Readers will also benefit from the descriptions of new chemistry and new synthetic methods included within Asymmetric Organo Metal Catalysis also provides Thorough introductions to chiral PTC metal cooperative catalysis and enamine metal cooperative catalysis Comprehensive explorations of iminium metal relay catalysis and cooperative catalysis of bronsted acids and transition metals Practical discussions of metal bronsted acid relay catalysis and Lewis base Lewis acid cooperative catalysis In depth examinations of Lewis base transition metal cooperative catalysis and photocatalysis combined with organocatalysis Perfect for organic catalytic and pharmaceutical chemists Asymmetric Organo Metal Catalysis Concepts Principles and Applications is also an invaluable resource for chemists working with or on organometallics **Science of Synthesis: Asymmetric**

Organocatalysis Vol. 2 K. Maruoka, 2014-05-14 Asymmetric Organocatalysis 2 from the Science of Synthesis series gives an authoritative broad overview of the field compiled by 38 experts as well as a critical presentation of the best organocatalytic and related methodologies available today for practical asymmetric synthesis It provides alternative greener syntheses with simple and easily used catalysts helping avoid the use of expensive and/or toxic metals The reference work covers all the catalysts and reactions within the activation modes Bronsted base catalysis and Bronsted acid catalysis Typical or general experimental procedures as well as mechanistic technical and theoretical aspects are included allowing the reader to clearly see how simple clean and efficient this chemistry is The content of this eBook was originally published in December 2011

Nanotechnology for the Energy Challenge Javier García-Martínez, 2010-01-12 Unique in providing an overview of the subject on the scientific level this book presents the current state of the art with regard to different aspects of sustainable energy production and its efficient storage The broad scope ranges from nanomaterials for energy production via fuel cells and nanostructured materials for fuel production right up to supercapacitors and climate change Edited by a rising star within the community this is an invaluable work on a hot topic for materials scientists solid state surface and physical chemists as well as those chemists working in industry and chemical engineers **Proceedings of European Organic**

Chemistry Congress 2018 Conference Series, March 01-03 2018 London UK Key Topics Elementary Concepts of Organic Chemistry Inorganic Organometallic Compounds BioOrganic Chemistry Carbohydrates and Phenols StereoChemistry Analytical techniques in Organic Chemistry Carboxylic acids and its derivatives Chemical Bonding Cheminformatics Green and Environmental Chemistry Polymers and Monomers Biochemistry and agricultural chemistry Catalysis of Organic Reactions Physical Organic Chemistry Natural Product Chemistry Flow Chemistry Organic Photochemistry Medicinal Chemistry Electro Organic Chemistry

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