

Organometallics Christoph Elschenbroich

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Spectacular Chemical Experiments John Wiley & Sons

Everyone is becoming more environmentally conscious and therefore, chemical processes are being developed with their environmental burden in mind. This also means that more traditional chemical methods are being replaced with new innovations and this includes new solvents. Solvents are everywhere, but how necessary are they? They are used in most areas including synthetic chemistry, analytical chemistry, pharmaceutical production and processing, the food and flavour industry and the materials and coatings sectors. However, the principles of green chemistry guide us to use less of them, or to use safer, more environmentally friendly solvents if they are essential. Therefore, we should always ask ourselves, do we really need a solvent? Green chemistry, as a relatively new sub-discipline, is a rapidly growing field of research. Alternative solvents - including supercritical fluids and room temperature ionic liquids - form a significant

portion of research in green chemistry. This is in part due to the hazards of many conventional solvents (e.g. toxicity and flammability) and the significant contribution that solvents make to the waste generated in many chemical processes. Solvents are important in analytical chemistry, product purification, extraction and separation technologies, and also in the modification of materials. Therefore, in order to make chemistry more sustainable in these fields, a knowledge of alternative, greener solvents is important. This book, which is part of a green chemistry series, uses examples that tie in with the 12 principles of green chemistry e.g. atom efficient reactions in benign solvents and processing of renewable chemicals/materials in green solvents. Readers get an overview of the many different kinds of solvents, written in such a way to make the book appropriate to newcomers to the field and prepare them for the 'green choices' available. The book also removes some of the mystique associated with 'alternative solvent' choices and includes information on solvents in different fields of chemistry such as analytical and materials chemistry in addition to catalysis and synthesis. The latest research developments, not covered elsewhere, are included such as switchable solvents and biosolvents. Also, some important areas that are

often overlooked are described such as naturally sourced solvents (including ethanol and ethyl lactate) and liquid polymers (including poly(ethyleneglycol) and poly(dimethylsiloxane)). As well as these additional alternative solvents being included, the book takes a more general approach to solvents, not just focusing on the use of solvents in synthetic chemistry. Applications of solvents in areas such as analysis are overviewed in addition to the more widely recognised uses of alternative solvents in organic synthesis. Unfortunately, as the book shows, there is no universal green solvent and readers must ascertain their best options based on prior chemistry, cost, environmental benefits and other factors. It is important to try and minimize the number of solvent changes in a chemical process and therefore, the importance of solvents in product purification, extraction and separation technologies are highlighted. The book is aimed at newcomers to the field whether research students beginning investigations towards their thesis or industrial researchers curious to find out if an alternative solvent would be suitable in their work.

Landmarks in Organo-Transition Metal Chemistry John Wiley & Sons

The last two decades have seen a renaissance in interest in the chemistry of the main group

elements. In particular research on the metals of group 13 (aluminium, gallium, indium and thallium) has led to the synthesis and isolation of some very novel and unusual molecules, with implications for organometallic synthesis, new materials development, and with biological, medical and, environmental relevance. The Group 13 Metals Aluminium, Gallium, Indium and Thallium aims to cover new facts, developments and applications in the context of more general patterns of physical and chemical behaviour. Particular attention is paid to the main growth areas, including the chemistry of lower formal oxidation states, cluster chemistry, the investigation of solid oxides and hydroxides, advances in the formation of III-V and related compounds, the biological significance of Group 13 metal complexes, and the growing importance of the metals and their compounds in the mediation of organic reactions. Chapters cover: general features of the group 13 elements group 13 metals in the +3 oxidation state: simple inorganic compounds formal oxidation state +3: organometallic chemistry formal oxidation state +2: metal-metal bonded vs. mononuclear derivatives group 13 metals in the +1 oxidation state mixed or intermediate valence group 13 metal compounds aluminium and gallium clusters: metalloid clusters and their relation to the bulk phases, to naked clusters, and to nanoscaled materials simple and mixed metal oxides and hydroxides: solids with extended structures of different dimensionalities and porosities coordination and solution chemistry of the metals: biological, medical and, environmental relevance III-V and related semiconductor materials group 13 metal-mediated organic reactions The Group 13 Metals Aluminium, Gallium, Indium and Thallium provides a detailed, wide-ranging, and up-to-date review of the chemistry of this important group of metals. It will find a place on the bookshelves of practitioners, researchers and students working in inorganic, organometallic, and materials chemistry.

The Group 13 Metals Aluminium, Gallium, Indium and Thallium Walter de Gruyter GmbH & Co KG Since the discovery of ferrocene and the sandwich-type complexes, the development of organometallic chemistry took its course like an avalanche and became one of the scientific success stories of the second half of the twentieth century. Based on this development, the traditional boundaries between inorganic and organic chemistry gradually disappeared and a rebirth of the nowadays highly important field of homogeneous catalysis occurred. It is fair to say that despite the fact that the key discovery, which sparked it all off, was made more than 50 years ago, organometallic chemistry remains a young and lively discipline.

Multiple Bonds Between Metal Atoms Elsevier

This volume gives an overview of the applications of organometallic chemistry in process chemistry relevant to the current topics in synthetic chemistry. This volume starts with an introduction on the historical development of organometallics in process chemistry and is followed by chapters dealing with the last five years' development in various organometallic reaction types such as the challenging cross coupling process, construction of 3.1.0 bicycles, pressure and transfer hydrogenations of historically challenging compounds such as esters, utilization of carbon dioxide for making organic compounds by flow process, drug synthesis and metal detection and scavenging in the finished APIs. A chapter by Colacot et al., is also devoted to the process development and structural understanding of organometallic catalysts with particular emphasis to LnPd(0) catalysts. An academia - industry collaborated chapter on the use of water as a solvent for organometallic processes is included in this book.

Organometallic Chemistry of the Transition Elements Oxford University Press, USA

This volume covers both basic and advanced aspects of organometallic chemistry of all metals and catalysis. In order to present a comprehensive view of the subject, it provides broad coverage of organometallic chemistry itself. The catalysis section includes the challenging activation and fictionalization of the main classes of hydrocarbons and the industrially crucial heterogeneous catalysis. Summaries and exercises are provided at the end of each chapter, and the answers to these exercises can be found at the back of the book. Beginners in inorganic, organic and organometallic chemistry, as well as advanced scholars and chemists from academia and industry will find much value in this title.

Organometallics in Process Chemistry Springer Science & Business Media

Over the past 20 years aqueous organometallic catalysis has found applications in small- scale organic synthesis in the laboratory, as well as in the industrial production of chemicals with a combined output close to one million tons per year. Aqueous/organic two-phase reactions allow easy product-catalyst separation and full catalyst recovery which mean clear benefits not only in economic but also in environmental and green chemistry contexts. Instead of putting together a series of expert reviews of specialized fields, this book attempts to give a comprehensive yet

comprehensible description of the various catalytic transformations in aqueous systems as seen by an author who has been working on aqueous organometallic catalysis since its origin. Emphasis is put on the discussion of differences between related non-aqueous and aqueous processes due to the presence of water. The book will be of interest to experts and students working in catalysis, inorganic chemistry or organic synthesis, and may serve as a basis for advanced courses.

Applications of Organometallic Compounds John Wiley & Sons

Until recently the low-coordinate compounds of the heavier elements of group 14 were known only as transient, unstable species which were difficult to isolate. However recent developments have led to the stabilisation of these compounds and today heavier group 14 element cations, radicals, anions, carbene analogues, alkene and alkyne analogues and aromatics have all been prepared as highly reactive, stable, fully characterizable and readily available organometallic reagents. Organometallic Compounds of Low-Coordinate Si, Ge, Sn and Pb describes the chemistry of this exciting new class of organometallics, with an emphasis on their major similarities and differences with the analogous species in organic chemistry. Topics covered include the synthesis, structure, reactions and synthetic applications of: Si-, Ge-, Sn and Pb-centered cations, radicals and anions heavy analogues of carbenes: silylenes, germylenes, stannylenes and plumblylenes heavy analogues of alkenes: disilenes, digermenes, distannenes, diplumbenes heavy analogues of alkynes: disilynes, digermynes, distannynes, diplumbynes, and their valence isomers heteronuclear derivatives: silenes, germenes, stannenes, silagermenes, silastannenes, germastannenes heavy analogues of alkenes of the type: >E14=E13-, >E14=E15-, >E14=E16 [where E13, E14, E15 and E16 are elements of the groups 13, 14, 15 and 16] cyclic compounds (three-, four-, five-, and six-membered rings) heavy analogues of 1,3-dienes, allenes and other cumulenes heavy analogues of aromatic compounds; including a comparison between organometallic and organic aromaticity Organometallic Compounds of Low-Coordinate Si, Ge, Sn and Pb is an essential guide to this emerging class of organometallic reagents for researchers and students in main group, organometallic, synthetic and silicon chemistry

NMR in Organometallic Chemistry John Wiley & Sons

THE textbook on organometallic chemistry. Comprehensive and up-to-date, the German original is already a classic, making this third completely revised and updated English edition a must for graduate students and lecturers in chemistry, inorganic chemists, chemists working with/on organometallics, bioinorganic chemists, complex chemists, and libraries. Over one third of the chapters have been expanded to incorporate developments since the previous editions, while the chapter on organometallic catalysis in synthesis and production appears for the first time in this form. From the reviews of the first English editions: 'The selection of material and the order of its presentation is first class ... Students and their instructors will find this book extraordinarily easy to use and extraordinarily useful.' -Chemistry in Britain 'Elschenbroich and Salzer have written the textbook of choice for graduate or senior-level courses that place an equal emphasis on main group element and transition metal organometallic chemistry. ... this book can be unequivocally recommended to any teacher or student of organometallic chemistry.' - Angewandte Chemie International Edition 'The breadth and depth of coverage are outstanding, and the excitement of synthetic organometallic chemistry comes across very strongly.' - Journal of the American Chemical Society

Introduction to Reticular Chemistry John Wiley & Sons

Introduces readers to the field of inorganic materials, while emphasizing synthesis and modification techniques Written from the chemist's point of view, this newly updated and completely revised fourth edition of Synthesis of Inorganic Materials provides a thorough and pedagogical introduction to the exciting and fast developing field of inorganic materials and features all of the latest developments. New to this edition is a chapter on self-assembly and self-organization, as well as all-new content on: demixing of glasses, non-classical crystallization, precursor chemistry, citrate-gel and Pechini liquid mix methods, ice-templating, and materials with hierarchical porosity. Synthesis of Inorganic Materials, 4th Edition features chapters covering: solid-state reactions; formation of solids from the gas phase; formation of solids from solutions and melts; preparation and modification of inorganic polymers; self-assembly and self-organization; templated materials; and nanostructured materials. There is also an extensive glossary to help bridge the gap between chemistry, solid state physics and materials science. In addition, a selection of books and review articles is provided at the end of each chapter as a starting point for more in-depth reading. -Gives the students a thorough overview of the fundamentals and the wide variety of different inorganic materials with applications in research as well as in industry -Every

chapter is updated with new content -Includes a completely new chapter covering self-assembly and self-organization -Written by well-known and experienced authors who follow an intuitive and pedagogical approach Synthesis of Inorganic Materials, 4th Edition is a valuable resource for advanced undergraduate students as well as masters and graduate students of inorganic chemistry and materials science.

From Coello to Inorganic Chemistry Springer Science & Business Media

Designed with the needs of both undergraduate and graduate students in mind, Organometallic Chemistry, Third Edition, covers the fundamentals of organometallic chemistry by presenting seminal experiments, analyzing real data, and offering the most comprehensive problem sets available. The text opens with careful explanations of the structure and bonding of organometallic compounds, providing a uniquely accessible introduction to the subject for undergraduate students. Later chapters build on this foundation with in-depth coverage of more advanced topics such as organometallic reaction mechanisms, catalysis, carbene complexes, metathesis, applications of organometallic chemistry to organic synthesis, and bioorganometallic chemistry.

Concepts and Models in Bioinorganic Chemistry John Wiley & Sons

Applications of Organometallic Compounds Iwao Omae Omae Research Laboratories, Japan Applications of Organometallic Compounds is a comprehensive and in-depth survey of all recent developments in organometallic chemistry. Chapter by chapter, the author discusses 20 of the most common elements used in organometallic chemistry. Each chapter describes the synthesis of the organometallic compounds of the element, their structure and their importance in organic transformations. Applications of Organometallic Compounds: * Combines a full background to the topic with comprehensive organic syntheses. * Contains a historical overview of organometallic chemistry. * Discusses the possible side reactions that are caused by impurities in each organometallic reagent. * Includes the basic coordination chemistry of organometallics. * Contains hundreds of reaction examples and extensive referencing. The book is intended to be an introduction to organometallic chemistry for research chemists in organic, natural product and pharmaceutical synthetic chemistry.

Organometallics in Environment and Toxicology Springer Nature

The first and ultimate guide for anyone working in transition organometallic chemistry and related fields, providing the background and practical guidance on how to efficiently work with routine research problems in NMR. The book adopts a problem-solving approach with many examples taken from recent literature to show readers how to interpret the data. Perfect for PhD students, postdocs and other newcomers in organometallic and inorganic chemistry, as well as for organic chemists involved in transition metal catalysis.

Aqueous Organometallic Catalysis John Wiley & Sons

Destined to set the standard, this book meets the need for a didactic textbook focusing on the role of model systems in bioinorganic chemistry. The first part features concepts in bioinorganic chemistry such as electron transfer, medicinal inorganic chemistry, bioorganometallics and metal DNA complexes, while the second part presents inorganic model chemistry on metallo-enzymes, organized by metal ion. Experts in the pertinent fields provide a didactically well-organized background on relevant biological systems, as well as on their structural, functional and spectroscopic properties. All chapters are similarly structured, each one beginning with a timeline featuring the most important historical facts on the subject, followed by a table of the most significant enzymes. The authors also summarize key developments and open questions within the respective model systems. This book is aimed at senior undergraduate and graduate students in chemistry, biochemistry, life science and related fields.

Organometallic Chemistry and Catalysis Wiley-VCH

This comprehensive series of volumes on inorganic chemistry provides inorganic chemists with a forum for critical, authoritative evaluations of advances in every area of the discipline. Every volume reports recent progress with a significant, up-to-date selection of papers by internationally recognized researchers, complemented by detailed discussions and complete documentation. Each volume features a complete subject index and the series includes a cumulative index as well.

Synthesis of Inorganic Materials John Wiley & Sons

Most reactions in organic chemistry do not proceed in a single step but rather take several steps to yield the desired product. In the course of these multi-step reaction sequences, short-lived intermediates can be generated that quickly convert into other intermediates, reactants, products or side products. As these intermediates are highly reactive, they cannot usually be isolated, but their existence and structure can be proved by theoretical and experimental methods. Using the

information obtained, researchers can better understand the underlying reaction mechanism of a certain organic transformation and thus develop novel strategies for efficient organic synthesis. The chapters are clearly structured and are arranged according to the type of intermediate, providing information on the formation, characterization, stereochemistry, stability, and reactivity of the intermediates. Additionally, representative examples and a problem section with different levels of difficulty are included for self-testing the newly acquired knowledge. By providing a deeper understanding of the underlying concepts, this is a must-have reference for PhD and Master Students in organic chemistry, as well as a valuable source of information for chemists in academia and industry working in the field. It is also ideal as primary or supplementary reading for courses on organic chemistry, physical organic chemistry or analytical chemistry.

Organolithium Methods John Wiley & Sons

The efficacy of isocyanide reactions in the synthesis of natural or natural-like products has resulted in a renaissance of isocyanide chemistry. Now isocyanides are widely used in different branches of organic, inorganic, coordination, combinatorial and medicinal chemistry. This invaluable reference is the only book to cover the topic in such depth, presenting all aspects of synthetic isonitrile chemistry. The highly experienced and internationally renowned editor has brought together an equally distinguished team of authors who cover multicomponent reactions, isonitriles in total synthesis, isonitriles in polymer chemistry and much more.

Modern Organic Synthesis Royal Society of Chemistry

A concise introduction to the chemistry and design principles behind important metal-organic frameworks and related porous materials. Reticular chemistry has been applied to synthesize new classes of porous materials that are successfully used for myriad applications in areas such as gas separation, catalysis, energy, and electronics. Introduction to Reticular Chemistry gives an unique overview of the principles of the chemistry behind metal-organic frameworks (MOFs), covalent organic frameworks (COFs), and zeolitic imidazolate frameworks (ZIFs). Written by one of the pioneers in the field, this book covers all important aspects of reticular chemistry, including design and synthesis, properties and characterization, as well as current and future applications. Designed

to be an accessible resource, the book is written in an easy-to-understand style. It includes an extensive bibliography, and offers figures and videos of crystal structures that are available as an electronic supplement. Introduction to Reticular Chemistry: -Describes the underlying principles and design elements for the synthesis of important metal-organic frameworks (MOFs) and related materials -Discusses both real-life and future applications in various fields, such as clean energy and water adsorption -Offers all graphic material on a companion website -Provides first-hand knowledge by Omar Yaghi, one of the pioneers in the field, and his team. Aimed at graduate students in chemistry, structural chemists, inorganic chemists, organic chemists, catalytic chemists, and others, Introduction to Reticular Chemistry is a groundbreaking book that explores the chemistry principles and applications of MOFs, COFs, and ZIFs.

The Quantum Theory of Atoms in Molecules John Wiley & Sons

This book bridges the gap between sophomore and advanced / graduate level organic chemistry courses, providing students with a necessary background to begin research in either an industry or academic environment. • Covers key concepts that include retrosynthesis, conformational analysis, and functional group transformations as well as presents the latest developments in organometallic chemistry and C-C bond formation • Uses a concise and easy-to-read style, with many illustrated examples • Updates material, examples, and references from the first edition • Adds coverage of organocatalysts and organometallic reagents

The Chemistry of Organolithium Compounds John Wiley & Sons

Organometallic chemistry belongs to the most rapidly developing area of chemistry today. This is due to the fact that research dealing with the structure of compounds and chemical bonding has been greatly intensified in recent years. Additionally, organometallic compounds have been widely utilized in catalysis, organic synthesis, electronics, etc. This book is based on my lectures concerning basic organometallic chemistry for fourth and fifth year chemistry students and on my lectures concerning advanced organometallic chemistry and homogeneous catalysis for Ph.D. graduate students. Many recent developments in the area of organometallic chemistry as well as

homogeneous catalysis are presented. Essential research results dealing with a given class of organometallic compounds are discussed briefly. Results of physicochemical research methods of various organometallic compounds as well as their synthesis, properties, structures, reactivities, and applications are discussed more thoroughly. The selection of tabulated data is arbitrary because, often, it has been impossible to avoid omissions. Nevertheless, these data can be very helpful in understanding properties of organometallic compounds and their reactivities. All physical data are given in SI units; the interatomic distances are given in pm units in figures and tables. I am indebted to Professor S. A. Duraj for translating and editing this book. His remarks, discussions, and suggestions are greatly appreciated. I also express gratitude to Virginia E. Duraj for editing and proofreading.

Organometallics and Catalysis John Wiley & Sons

Titanium has been used to perform many kinds of reactions in organic and inorganic chemistry. The present book is concerned primarily with a new development in titanium chemistry which is useful in organic synthesis. In 1979/80 it was discovered that the titanation of classical carbanions using C1TiX leads to species with reduced basicity and reactivity. This increases 3 chemo-, regio- and stereo selectivity in reactions with organic compounds such as aldehydes, ketones and alkyl halides. Many new examples have been reported in recent times. Since the nature of the ligand X at titanium can be widely varied, the electronic and steric nature of the reagents is easily controlled. This helps in predicting the stereochemical outcome of many of the C-C bond forming reactions, but the trial and error method is still necessary in other cases. One of the ultimate objectives of chemistry is to understand correlations between structure and reactivity. Although this goal has not been reached in the area of organotitanium chemistry, appreciable progress has been made. A great deal of physical and computational data of organotitanium compounds described in the current and older literature (e. g. , Ziegler-Natta type catalysts) has been reported by polymer, inorganic and theoretical chemists. It is summarized in Chapter 2 of this book, because some aspects are useful in understanding reactivity and selectivity of organo titanium compounds in organic synthesis as described in the chapters which follow.