Stereospecific Olefin Polymerization Catalyzed By

Since the beginning of the 1960s, the coordinative polymerization of conjugated dienes has continuously improved. Today, chemists know how to polymerize conjugated dienes stereospecifically and in a controlled fashion, both petro-sourced (nowadays also bio-sourced) and those of natural origin. The industry has greatly improved the performances of the catalytic systems—covering a wide range of elements including metals from groups 4-6 and 8-10, and rare earths—with the aim of optimizing the preparation of synthetic polymers for a large range of industrial applications. Nowadays, there is a better understanding of the polymerization mechanism involving allyl-active species, thanks in particular to the support of more efficient calculation methods. In addition, statistical copolymerization of 1,3-dienes with olefin or styrene comonomers and innovative approaches to coordinative chain transfer polymerization allow the production of copolymers with controlled topology, while a last challenge is about to be solved with the preparation of stereoregular polydienes that are also end-functionalized. This issue brings together several important aspects of this chemistry that remain at the forefront of both academic and industrial research.

This book is part of a two-volume work that offers a unique blend of information on realistic evaluations of catalyst-based synthesis processes using green chemistry principles and the environmental sustainability applications of such processes for biomass conversion, refining, and petrochemical production. The volumes provide a comprehensive resource of state-of-the-art technologies and green chemistry methodologies from researchers, academics, and chemical and manufacturing industrial scientists. The work will be of interest to professors, researchers, and practitioners in clean energy catalysis, green chemistry, chemical engineering and manufacturing, and environmental sustainability. This volume focuses on catalyst synthesis and green chemistry applications for petrochemical and refining processes. While most books on the subject focus on catalyst use for conventional crude, fuel-oriented refineries, this book emphasizes recent transitions to petrochemical refineries with the goal of evaluating how green chemistry applications can produce clean energy through petrochemical industrial means. The majority of the chapters are contributed by industrial researchers and technicians and address various petrochemical processes, including hydrotreating, hydrocracking, flue gas treatment and isomerization catalysts.

The proposed book focusses on metal mediated/catalyzed “controlled/living radical polymerization” (CRP/LRP) methods. It surveys a wide variety of catalyzed polymerization reactions, making it essentially a “one stop” review in the field. A significant contribution to polymer science is “metathesis polymerization” discovered by Grubbs and others. The book will cover various metathesis polymerization methods and implications in polymer industry.

Ziegler-Natta Catalysts and Polymerizations reviews the general aspects of Ziegler-Natta catalysts and polymerizations of olefins, dienes, and many other types of monomers. Topics covered include the physical state of the polymer during polymerization; modification of Ziegler-Natta catalysts by third components; and termination of polymer chain growth. The oxidation state of catalysts and active centers is also discussed, along with copolymerizations and block polymerizations. This book is comprised of 23 chapters and begins with an overview of Ziegler-Natta catalysts and polymerizations, their historical origins, scientific and commercial importance, and major advances in polymer science. The next chapter focuses on definitions and stereochemistry of Ziegler-Natta catalysts, together with analytical methods used to identify and quantitatively measure their structures. Some of the polymers produced commercially with Ziegler-Natta catalysts are considered. The discussion then turns to mechanisms for initiating and propagating olefins; mechanisms for stereochemical control of conjugated and nonconjugated dienes; and the basic kinetic parameters that characterize Ziegler-Natta polymerizations. This monograph is written especially for chemistry and engineering graduate students and for industrial chemists, engineers, and managers who may become involved in a Ziegler-Natta problem.

Fundamentals of Organometallic Catalysis

Metallocenes in Regio- and Stereoselective Synthesis

Stereoregular Polymers and Stereospecific Polymerizations

Metal-Catalyzed Polymerization

Polymerization and Characterization

This book provides the broad scientific readership with a comprehensive summary and critical overview of a topic in organometallic chemistry. A wide variety of catalytic functionalization reactions of C-H bonds by the utilization of a chelation have been developed recently and are comprehensively discussed in this book by leading experts. In addition, new approaches to directed hydrometalation and directed carbometalation as a key step are also discussed.

For the first time the discipline of modern inorganic chemistry has been systematized according to a plan constructed by a council of editorial advisors and consultants, among them three Nobel laureates (E.O. Fischer, H. Taube and G. Wilkinson). Rather than producing a collection of unrelated review articles, the series creates a framework which reflects the creative potential of this scientific discipline. Thus, it stimulates future development by identifying areas which are fruitful for further research. The work is indexed in a unique way by a structured system which maximizes its usefulness to the reader. It augments the organization of the work by providing additional routes of access for specific compounds, reactions and other topics.

In this book leading experts have surveyed major areas of application of NHC metal complexes in catalysis. The authors have placed a special focus on nickel- and palladium-catalyzed reactions, on applications in metathesis reactions, on oxidation reactions and on the use of chiral NHC-based catalysts. This compilation is rounded out by an introductory chapter and a chapter dealing with synthetic routes to NHC metal complexes.

This book provides a comprehensive summary and critical overview of a topic in organometallic chemistry. Research in this rapidly developing transdisciplinary field is having profound influence on other areas of scientific investigation, ranging from catalytic organic synthesis to biology, medicine and material science. The book is complemented by a review of metallodendritic exoreptors for the redox recognition of oxo-anions and halides.

Stereoselective Polymerization with Single-Site Catalysts

Organometallics

Olefin Upgrading Catalysis by Nitrogen-based Metal Complexes I

Fundamentals to Applications

Regulated Systems for Multiphase Catalysis

Collecting information of vital interest to chemical, polymer, mechanical, electrical, and civil engineers, as well as chemists and chemical researchers, this "Encyclopedia "supplies nearly 350 articles on current design, engineering, science, and manufacturing practices-offering expertly written articles on technologies at the forefront of the field to maximize and enhance the research and production phases of current and emerging chemical manufacturing practices and techniques.

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

Metallocene is a well known sandwich complex with two cyclopentadienyl ligands such as ferrocene. Recently, such metallocene compounds have been found to be very characteristic and they have become very important, not only in the area of organic synthesis, but also in polymerization in industry. Metal complexes with one cyclopentadienyl ligand have also become popular as half sandwich complexes. The number of researchers in the field of metallocenes has increased rapidly. However, the origin of the characteristic reactivity of metallocenes is not fully understood. In this volume, the chemistry of metal complexes with at least one cyclopentadienyl ligand is comprehensively covered by leading experts. Reactions discussed here are (i) natural product synthesis, (ii) catalytic asymmetric synthesis, (iii) cyclization reactions, (iv)catalytic reactions, (iv) polymerization reactions and (v) carbon-carbon bond cleavage reactions. The reader will have access to useful information about the current state of metallocene chemistry.

In many of the processes of oxidation catalysis, species with metal-carbon bonds are formed as key intermediates, and these processes represent the primary focus of this volume. An important aspect covered by some of the contributors is the use of organic ligands to achieve efficient oxidation catalysis. Each volume of "Topics in Organometallic Chemistry" provides a comprehensive summary and critical overview of a specific topic in organometallic chemistry.

Theoretical Aspects of Transition Metal Catalysis

Polypropylene and other Polyolefins

Organometallic Oxidation Catalysis

Metathesis Polymerization of Olefins and Polymerization of Alkynes

Gnosis to Prognosis

This book provides the reader with a comprehensive introduction to the topic of organometallic chemistry. With an easy to follow structure covering both non-transition metals and transition metals as well as the applications of organometallic reagents in organic synthesis, this book is a must-have for the organometallic chemist. Thematic overview of organometallic compounds of transition and non-transition metals. Covers structures as well as applications.

New synthetic techniques allow chemists to modify polymer microstructures more precisely than ever, making it possible to design materials that meet increasingly demanding performance requirements. Written and edited by experts in the field, Stereoselective Polymerization with Single-Site Catalysts reviews how the relative stereochemistry of polymer chains affects polymer properties and presents the latest strategies for developing tactic polymers using single-site catalysis. This unified volume explains the mechanistic basics of tactic polymerizations, beginning with an extensive survey of the most important classes of metallocene and post-metallocene catalysts used to make polypropylenes. It also focuses on tactic stereoblock and ethylene/propylene copolymers and catalyst active site models, followed by chapters discussing the structure of more stereochemically complex polymers and polymerizations that proceed via non-vinyl-addition mechanisms. Individual chapters thoroughly describe tactic polymerizations of α-olefins, styrene, dienes, acetylenes, lactides, epoxides, acrylates, and cyclic monomers, as well as cyclopolymerizations and ditactic structures, olefin/CO polymers, and metathesis polyalkenamers. An ideal reference and supplementary text, Stereoselective Polymerization with Single-Site Catalysts enables both new and experienced chemists to better understand tactic polymers and select appropriate catalyst systems for their preparation.

More than 30 years after the discovery of transition metals and organometal lics as catalysts for olefin polymerization these catalysts did not have lost their fascination. Since 1953 when Karl Ziegler has discovered the catalytic polymerization of ethylene leading to plastically formable polymers which are mechanically stable up to temperatures of about 100°C, synthetic polymers and rubbers have made their way right into private houses. This discovery has been a main impetus for the fast growing production of plastics. The stereoselective poly merization of propylene and other long-chain a-olefins first detected by Giulio Natta leads to an even broadened field of applications. Another enforcing factor were the developments of Standard Oil of Indiana and Phillipps Petroleum Company who engaged in the polymerization of a-olefins supported molybdenum, cobalt and later on chromium catalysts which clearly indicates the wide variety of suitable systems. This kind of research acknowledged merit when in 1963 the Nobel prize of chemistry was awarded to Ziegler and Natta. Although to a great extent there is a technical application for these catalysts, up to now the nature of the active centres and many reaction mechanisms are not completely known.

Stereoregular Polymers and Stereospecific Polymerizations: The Contributions of Guilio Natta and his School to Polymer Chemistry, Volume 1 covers the developments in understanding the reactions, nomenclature, and physico-chemical properties of polymers. This volume is composed of 82 chapters, and starts with surveys of the synthesis and crystal structure of polymers. Significant chapters are devoted to the characterization of crystalline polymers, with emphasis on the determination of their viscosity and molecular weight. Other chapters deal with stereospecific polymers of olefins, mechanism of stereospecific catalysis, reaction kinetics. This volume also considers the polymerization of synthetic elastomers and the copolymerization of olefins, as well as their reaction kinetics. The remaining chapters describe the X-ray characterization of isotactic polymers. This book is directed toward polymer chemists.

Directed Metallation

Olefin Polymerization

Organometallic Reactions and Polymerization

Catalysts for the Controlled Polymerization of Conjugated Dienes

Transition Metal Catalyzed Polymerizations

Providing a range of information on polymers and polymerization techniques, this text covers the gamut of polymer science from synthesis, structure and properties to function and applications. It analyzes speciality polymers, including acrylics, fluoropolymers, polysiplanes, polyphosphazenes, and inorganic and conducting polymers. The book examines the stereochemistry of polymerization and the stereoregularity of polymers.

Including recent advances and historically important catalysts, this book overviews methods for developing and applying polymerization catalysts – dealing with polymerization catalysts that afford commercially acceptable high yields of polymer with respect to catalyst mass or productivity. • Contains the valuable data needed to reproduce syntheses or use the catalyst for new applications • Offers a guide to the design and synthesis of catalysts, and their applications in synthesis of polymers • Includes the information essential for choosing the appropriate reactions to maximize yield of polymer synthesized • Presents new chapters on vanadium catalysts, Ziegler catalysts, laboratory homopolymerization, and copolymerization

This compilation provides advanced graduate students and researchers with a structured overview of olefin polymerization. Divided into eight chapters written by international experts, this book covers polymerization using various organotransition-metal catalysts, including early and late transition metal complexes, new trends in olefin oligomerization and related reactions. All authors address the historic and scientific backgrounds of the field as well as current research progress and potential for further research. The complete book is designed to present eight independent lectures and, because all authors are well versed in organometallic chemistry, each is based on a profound understanding of the reactions and structures of organotransition metal complexes. This book is an ideal accompaniment for researchers taking courses in olefin polymerization and also serves as a valuable resource for teachers and lecturers of chemistry when planning and researching material for advanced lecture courses.

In this book, leading experts from academia and industry offer a comprehensive presentation and discussion of the major reaction types of carbon monoxide. The authors highlight important carbonylation reactions such as hydroformylation, alkoxy-carbonylations, co/olefin-copolymerization, Pauson-Khand reactions and others. They illustrate applications in organic synthesis and give industrial examples. This volume is designed to provide graduate students and researchers with essential information on the use of carbon monoxide in organic synthesis.

Catalytic Carbonylation Reactions

Chemical Synthesis

Alkenes and Dienes : Papers Presented at the Eleventh Midland Macromolecular Meeting Held August 17-21, 1981 in Midland, Michigan ; Edited by Roderic P. Quirk ... [et Al.].

Metal Complex Catalysts Supercritical Fluid Polymerization Supramolecular Architecture

Isospecific Polymerization of Olefins

Metal carbene complexes have made their way from organometallic curiosities to valuable reagents and catalysts. They offer novel synthetic opportunities in carbon-carbon bond formation based on either carbene-centered reactions or on metal-templated processes which makes them indispensable in modern synthetic methodology. The most prominent metal carbenes are now either commercially available or easy to synthesize and handle with modern laboratory techniques. This volume organized in eight chapters written by the leading scientists in the field illustrates the theoretical background, non-classical nucleophilic and cycloaddition patterns, chromium-templated benzannulation and photo-induced reactions, rhodium-catalyzed carbene transfer as well as the principles and applications of olefin metathesis which has coined the progress in synthetic methodology over the past decade. Designed for researchers in academia and industry as well as graduate students it presents the state-of-the-art potential of carbene complexes in modern organic synthesis.

This book deals with polyolefins prepared via Ziegler-Natta catalysis, from a polymer chemist's viewpoint, i.e. with emphasis on their preparation and on their basic composition and properties. In addition to chapters on catalysts, polymerization behaviour and polymer properties such as tacticity, crystallinity, morphology etc., a chapter is also devoted to characterization methods. The main part of this work is reserved for polypropylene in all its forms, namely, homopolymer, random copolymer and toughened (`block') copolymers, for which extensive own-experience was present. The other polyolefins are also covered by means of a thorough literature review. This book is intended for scientists active in the field of polyolefins, including catalyst development, but should also prove an invaluable medium in academia to illustrate the growth of understanding in catalysis, kinetics and characterization of a commercially very important class of polymers.

A metallocene catalyst system for the polymerization of .alpha.-olefins to yield stereospecific polymers including syndiotactic, and isotactic polymers. The catalyst system includes a metal and a ligand of the formula ##STR1## wherein: R.sup. 1, R.sup. 2, and R.sup. 3 are independently selected from the group consisting of hydrogen, C.sub. 1 to C.sub. 10 alkyl, 5 to 7 membered cycloalkyl, which in turn may have from 1 to 3 C.sub. 1 to C.sub. 10 alkyls as a substituent, C.sub. 6 to C.sub. 15 aryl or arylalkyl in which two adjacent radicals may together stand for cyclic groups having 4 to 15 carbon atoms which in turn may be substituted, or Si(R.sup. 8).sub. 3 where R.sup. 8 is selected from the group consisting of C.sub. 1 to C.sub. 10 alkyl, C.sub. 6 to C.sub. 15 aryl or C.sub. 3 to C.sub. 10 cycloalkyl; R.sup. 4 and R.sup. 6 are substituents both having van der Waals radii larger than the van der Waals radii of groups R.sup. 1 and R.sup. 3 ; R.sup. 5 is a substituent having a van der Waals radius less than about the van der Waals radius of a methyl group; E.sup. 1, E.sup. 2 are independently selected from the group consisting of Si(R.sup. 9).sub. 2, Si(R.sup. 9).sub. 2 --Si(R.sup. 9).sub. 2, Ge(R.sup. 9).sub. 2, Sn(R.sup. 9).sub. 2, C(R.sup. 9).sub. 2, C(R.sup. 9).sub. 2 --C(R.sup. 9).sub. 2, where R.sup. 9 is C.sub. 1 to C.sub. 10 alkyl, C.sub. 6 to C.sub. 15 aryl or C.sub. 3 to C.sub. 10 cycloalkyl; and the ligand may have C.sub. S or C.sub. 1 -symmetry. Preferred metals are selected from the group consisting of group III, group IV, group V or lanthanide group elements. The catalysts are used to prepare stereoregular polymers including polypropylene from .alpha.-olefin monomers.

Transition metal catalysis belongs to the most important chemical research areas because a ubiquitous number of chemical reactions are catalyzed by transition metal compounds. Many efforts are being made by industry and academia to find new and more efficient catalysts for chemical processes. Transition metals play a prominent role in catalytic research because they have been proven to show an enormous diversity in lowering the activation barrier for chemical reactions. For many years, the search for new catalysts was carried out by trial and error, which was costly and time consuming. The understanding of the mechanism of the catalytic process is often not very advanced because it is difficult to study the elementary steps of the catalysis with experimental techniques. The development of modern quantum chemical methods for calculating possible intermediates and transition states was a breakthrough in gaining an understanding of the reaction pathways of transition metal catalyzed reactions. This volume, organized into eight chapters written by leading scientists in the field, illustrates the progress made during the last decade. The reader will obtain a deep insight into the present state of quantum chemical research in transition metal catalysis.

Fundamentals and Applications

New Aspects of Zirconium Containing Organic Compounds

Handbook of Boron Science

State-of-the-art and Perspectives

This book presents recent advances in computational methods for polymers. It covers multiscale modeling of polymers, polymerization reactions, and polymerization processes as well as control, monitoring, and estimation methods applied to polymerization processes. It presents theoretical insights gained from multiscale modeling validated with exprimental measurements. The book consolidates new computational tools and methods developed by academic researchers in this area and presents them systematically. The book is useful for graduate students, researchers, and process engineers and managers.

Stereospecific Olefin Polymerization Catalysts

With an enormous velocity, olefin polymerization has expanded to one of the most significant fields in polymers since the first industrial use about 50 years ago. In 2005, 100 million tons of polyolefins were produced - the biggest part was catalyzed by metallorganic compounds. The Hamburg Macromolecular Symposium 2005 with the title "Olefin Polymerization" involved topics such as new catalysts and cocatalysts, kinetics, mechanism and polymer reaction engineering, synthesis of special polymers, and characterization of polyolefins. The conference combined scientists from different disciplines to discuss latest research results of polymers and to offer each other the possibility of cooperation. This is reflected in this volume, which contains invited lectures and selected posters presented at the symposium.

A one-stop resource for understanding and applying polymerization catalysts An edited volume featuring contributions from leading researchers, the Handbook of Transition Metal Polymerization Catalysts covers the design and synthesis of catalysts, and their applications in synthesis of polymers. Dealing with those polymerization catalysts that afford commercially acceptable yields of polymer with respect to catalyst mass and promising newer catalysts, this practical reference provides polymer and organic chemists with a comprehensive overview of the known methods for developing and applying these important catalysts. With both recent advances and historically important catalysts, the subjects covered in this text include: Metal alkyls

and other compounds that function as co-catalysts with a large number of catalysts The varieties of porous silica either necessary or valuable in certain catalyst formulations Catalyst scale-up and commercialization Copper catalysts for olefin polymerization Morphology control Along with the above topics, the Handbook of Transition Metal Polymerization Catalysts provides tables of valuable data to assist in reproducing a synthesis or applying the knowledge to a new problem. Polymerization reactivities, polymer properties, monomer and solvent purity requirements, molecular weights, distribution, and reactivity ratios are also covered. The Handbook of Transition Metal Polymerization Catalysts offers an excellent one-stop resource for understanding and applying polymerization catalysts.

With Heterogeneous Ziegler-Natta Catalysts

The Contributions of Giulio Natta and His School to Polymer Chemistry

Handbook of Transition Metal Polymerization Catalysts

Inorganic Reactions and Methods, Reactions Catalyzed by Inorganic Compounds

Stereospecific Olefin Polymerization Catalysts

The discoveries of organometallic catalysts for olefin polymerization by Karl Ziegler and that of stereoregular olefin polymers by Giulio Natta are probably the two most important achievements in the areas of catalysis and polymer chemistry in the second half of this century. They led to the development of a new branch of chemical industry, and to a large volume production of high-density and linear low-density polyethylene, isotactic polypropylene, ethylene-propylene rubbers, isotactic poly I-butene, and poly-4-methyl-l-pentene. These discoveries merited the Nobel prize, which was awarded to K. Ziegler and G. Natta in 1963. The initial works of Ziegler and Natta were followed by an "explosion" of scientific papers and patents covering all aspects of polymerization chemistry, catalyst synthesis, and polymerization kinetics as well as the structural, chemical, physical, and technological characteristics of stereo regular polyolefins, polydienes, and olefin copolymers. It is sufficient to say that in the twenty-five years after the first publications more than 15,000 papers and patents appeared on subjects related to the area. . The development brought about the establishment of several prominent groups of scientists occupied with the study of olefin polymerization. The most important of these were scientific schools in Italy, Germany, England, the United States, Japan, the Soviet Union, Czechoslovakia, and Venezuela. In addition, many major chemical and petrochemical corporations throughout the world established labora tories devoted to the development of the technology of catalyst synthesis and olefin polymerization.

Boron science features in numerous fields including organic chemistry, organometallic chemistry and medicine. Boron is unique in all aspects of science and engineering and has made a significant impact in our daily lives through its use in fertilizers, germicides, fungicides, soaps, detergents, cancer drugs as well as many household glassware utensils, ceramics and cell phone windows. These volumes bring together an array of internationally renowned scientists to discuss the very latest developments in the application of boron in a broad range of disciplines. This multi-reference work describes the topic by appointing leading researchers to write on current developments in boron science, showcasing its importance to the four separate areas described in each volume: Organometallic Chemistry, Catalysis, Materials Chemistry and Medicine. Written to cover the full range of applications and innovations in boron science, this all-encompassing work offers us a one-stop reference compiled by world-leading researchers and practitioners of the subject, making it perfect for undergraduate and graduate students of chemistry, and researchers and practitioners interested in their professional development.

Chemical Synthesis: Gnosis to Prognosis (XTUllKtl ~uv8eoTr ana TT) rVWOT) OTT) npaYVWOT)) " . . . . other things being equal, that field has the most merit which contributes most heavily to, and illuminates most brightly, its neighbouring scientific disciplines[l] One hundred scientists, a blend of students, industrialists, and academics from twenty countries gathered to circumscribe, understand, and elaborate this topic in the magical setting of Ravello, Italy. The mandate of this workshop? To survey existing knowledge, assess current work, and discuss the future directions of chemical synthesis as it impinges on three exciting interdisciplinary themes of science in the 1990's: bioactive molecules, man-made chemical materials, and molecular recognition. This tempting but inexact menu summoned diverse students and scientists who wished to seriously reflect upon, dissect, and eject ideas and own experiences into open debate on this topic, which is at a crossroad in internal evolution and impact on the life and material sciences. The group arrived from many directions and in various forms of transportation, matters soon forgotten, when it found itself in the village which nurtured Wagner's inspiration and set to work immediately to ponder the question which has received extensive thought, prediction, and caveat from illustrious chemists over a period of time [2], two of which, to the delight of all, in presence among the Lectures.

Multiphase catalysis is a key technology for the competitive and sustainable production of fine chemicals in coming decades. A joint academic and industry consortium has developed tools for considering complex chemical and process-based requirements when setting up a catalytic system. This book shows how the resulting competence covers such supercritical fluid (SCF) technology in catalysis, ionic liquids (Il), ligand design for SFCs and Ils, thermomorphic solvent systems, reactor design and more.

Ziegler-Natta Catalysts Polymerizations

Organometallic Chemistry

Surface and Interfacial Organometallic Chemistry and Catalysis

Dendrimer Catalysis

Encyclopedia of Chemical Processing

The first NATO Advanced Study Institute on Olefin Metathesis and Polymerization Catalysts was held on September 10-22, 1989 in Akcay, Turkey. Based on the fundamental research of RRSchrock, RGrubbs and K.B.Wagener in the field of ring opening metathesis polymerization (ROMP), acyclic diene metathesis (ADMET) and alkyne polymerization, these areas gained growing interest within the last years. Therefore the second NATO-ASI held on metathesis reactions was on Ring Opening Metathesis Po lymerization of Olefins and Polymerization of Alkynes on September 3-16, 1995 in Akcay, Turkey. The course joined inorganic, organic and polymer chemists to exchange their knowledge in this field. This volume contains the main and short lectures held in Akcay. To include ADMET reactions better into the title of this volume we changed it into: Metathesis Polymerization of Olefins and Alkyne Polymerization. This volume is addressed to research scientists, but also to those who start to work in the area of olefin metathesis and alkyne polymerization. The topics of the course were: mechanism of ROMP reactions/ new catalysts for ROMP/ new products by ROMP/ new catalysts for ADMET/ new products by ADMETI degradation of polymer by metathesis reactions/ alkyne polymerization and metathesis/ industrial application of metathesis reactions. The Advanced Study Institute was generously sponsored by the Scientific Affairs Division of NATO and the editor gratefully acknowledges this sponsorship. We also thank the Members of the Local Organizing Committee for their engagement on a successful NATO-AS!.

Catalysis, the basic principle for overcoming the kinetic inhibition of chemical reactions, is fundamental in chemistry. In particular, organometallic catalysis plays an overwhelming role in both research and industry. It opens the way to entirely novel synthetic methods and finds widespread applications ranging from mass-production of everyday polymers to stereocontrolled synthesis of bioactive chemicals used as pharmaceuticals and agrochemicals. The targeted development of improved and novel catalysts demands understanding of the relationships between their structures and catalytic properties. Accordingly, this textbook offers the reader a fundamental understanding of the course of organometallic-catalyzed reactions, starting at the molecular level. The initial chapters explain the principles of catalysis and the elementary steps in organometallic catalysis. The book then explores important organometallic-catalyzed reactions, with a focus on mechanism. Current developments are emphasized throughout. Asymmetric synthesis is covered in depth. Finally, the book examines the catalytic behavior of particular metalloenzymes. A look at nitrogen fixation offers a comparative examination of the three major areas of catalysis - homogeneous, heterogeneous, and enzymatic. In addition to problems, the textbook offers solutions, making the book an invaluable learning tool. It is a must-have for advanced students in chemistry and biochemistry, as well as for inorganic and organic chemists, for those working with organometallics, and for those specializing in catalysis.

With contributions by numerous experts

This book highlights key advances that have occurred in the field of olefin conversion in recent years. The role of homogenous transition metal catalysts which contain an imine functionality is emphasized; their potential applications in the processing and upgrade of olefins to a wide variety of commodity products of very high industrial value is also explored. On the threshold of the fiftieth anniversary of the Noble Prize to Ziegler and Natta, this book gives a critical summary of the state of the art developments in the fascinating and rapidly developing field of the olefin polymerization, oligomerization, and co-polymerization catalysis.

Catalysis for Clean Energy and Environmental Sustainability

Computational Methods for Polymers

Metal Carbenes in Organic Synthesis

N-Heterocyclic Carbenes in Transition Metal Catalysis

Homogeneous Ziegler-Natta Catalysis for Stereospecific Olefin Polymerizations