



# Metathesis Polymerization of Olefins and Polymerization of Alkynes

Edited by

Yavuz Imamoglu

NATO ASI Series

# Metathesis Polymerization Of Olefins And Polymerization Of Alkynes

**K. J. Ivin, J. C. Mol**



## **Metathesis Polymerization Of Olefins And Polymerization Of Alkynes:**

**Metathesis Polymerization of Olefins and Polymerization of Alkynes** Yavuz Imamogammalu, 2012-12-06 The first NATO Advanced Study Institute on Olefin Metathesis and Polymerization Catalysts was held on September 10-22 1989 in Akçay Turkey Based on the fundamental research of R.R. Schrock, R. Grubbs 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 Polymerization of Olefins and Polymerization of Alkynes on September 3-16 1995 in Akçay 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 Akçay 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 ADMET 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 ASI

Metathesis Polymerization of Olefins and Polymerization of Alkynes Yavuz

Imamogammalu, 2014-01-15

**Olefin Metathesis and Metathesis Polymerization** K. J. Ivin, J. C. Mol, 1997-01-07 This book is a follow up to Ivin's Olefin Metathesis Academic Press 1983 Bringing the standard text in the field up to date this Second Edition is a result of rapid growth in the field sparked by the discovery of numerous well defined metal carbene complexes that can act as very efficient initiators of all types of olefin metathesis reaction including ring closing metathesis of acyclic dienes enynes and dienynes ring opening metathesis polymerization of cycloalkenes acyclic diene metathesis polymerization and polymerization of alkynes as well as simple olefin metathesis Olefin Metathesis and Metathesis Polymerization provides a broad up to date account of the subject from its beginnings in 1957 to the latest applications in organic synthesis The book follows the same format as the original making it useful to teachers and to researchers and will be of particular interest to those working in the fields of organic chemistry polymer chemistry organometallic chemistry catalysis materials science and chemical engineering Discusses different classes of olefin metathesis and the choice of reaction conditions and catalyst Considers commercial processes with examples from existing and new technologies Provides a complete overview of the subject from its beginning to the present day

*Ring Opening Metathesis Polymerisation and Related Chemistry* Ezat Khosravi, T. Szymanska-Buzar, 2012-12-06 Since the last ASI in Turkey in Sept 1995 the olefin metathesis has made remarkable strong developments with an incredible speed in various directions New catalyst systems

have been developed which have resulted in the synthesis of novel materials Other fascinating developments have been the new catalysts for stereoselective metathesis and catalysts with considerable functional group tolerance These new catalysts in addition to Ring Opening Metathesis Polymerisation ROMP and Acyclic Diene Metathesis ADMET are now powerful tools for Ring Closing Metathesis RCM and have found many applications in the synthesis of natural products A lot of information has been established about all aspects of the olefin metathesis and there is a vast literature concerning the process covering the initiators mechanistic features and applications of this reaction in organic and polymer synthesis The NATO ASI on rd th ROMP and Related Chemistry took place in Polanica Zdroj Poland during 3 to 15 Sept 2000 to highlight the developments in this area and to discuss the prospects and visions for the year 2000 and beyond The aims of the ASI were to provide a platform for dissemination of knowledge to promote communication between people who have a serious interest in this field of chemistry to help establishing international scientific contacts and to provide an opportunity for the scientists with an appropriate scientific background to learn of recent developments in this field of science There were 15 lecturers and 67 participants in this NATO ASI

**Handbook of Polyolefins** Cornelia Vasile,2000-06-21 A handbook on polyolefins This second edition includes new material on the structure morphology and properties of polyolefin PO synthesis It focuses on synthetic advances the use of additives special coverage of PO blends composites and fibres and surface treatments It also addresses the problem of interfacial and superficial phenomena

**Olefin Metathesis and Polymerization Catalysts** Yavuz Imamogamalu,Birgül Zümreogamalu-Karan,Allan J. Amass,2012-12-06 Olefin metathesis reaction can be considered as one of the most successful organic reactions with many applications in the low molecular weight range and also in the polymer field The use of catalysts with their selective and effective transformation properties in olefin metathesis I polymerization systems is a growing interest There has been great effort and competition in developing active and commercially useful catalysts The main aim of this ASI was to gather several research groups and also the people from industry to present existing knowledge and latest results in the field A wide range of topics through homogeneous and heterogeneous aspects have been considered Attention has been drawn to the metal carbene and metallacyclobutane complexes as active species the initiation mechanisms the stereochemistry and thermodynamics of these reactions New catalytic systems for the metathesis of alkenes and alkynes and fot ring opening polymeriZation I block copolymerization reactions have been introduced Spectroscopic studies for the characteriZation of catalysts simulation studies explaining the function of chain carrier species and polymer degradation have also been covered A detailed industrial report concerning the patents and applications in olefin metathesis I cyc1001efin polymerization area fabrication and derivation has been presented This volume contains the main lectures and seminars given at the NATO Advanced Study Institute on Olefin Metathesis and Polymerization Catalysts Synthesis Mechanism and Utilization held at Akcay Babkesir Turkey between 10th and 22nd September 1989

*Catalytic Polymerization of Cycloolefins* V. Dragutan,R. Streck,2000-06-26 This book covers

the most important topics concerning cationic Ziegler Natta and ring opening metathesis polymerization of cycloolefins The work describes the major pathways that cycloolefins can follow under the action of specific catalytic systems essentially vinyl and ring opening polymerization both reaction types allowing the manufacture of distinct products with wide applicability in modern technologies The comprehensive data available on this subject are logically and systematically selected and reviewed throughout 18 chapters according to the basic catalytic processes involved types of monomers and catalysts employed reaction conditions and application fields The modern trends in design of chiral metallocene catalysts well defined living metathesis catalysts catalysts tolerant toward functionalities and water systems are highlighted The book discusses in detail the relevant aspects of these processes including reaction thermodynamics kinetics mechanisms and stereochemistry and correlates the structure of produced polymers with their chemical and physical mechanical properties Related important topics include Ziegler Natta polymerization of olefins and dienes atom transfer radical polymerization of vinyl compounds metathesis of olefins and acetylenes acyclic diene metathesis reaction carbonyl olefination reaction metathesis polymerization of acetylenes metathesis degradation of polymers and ring opening polymerization of heterocycles Special emphasis is laid upon the manufacture of commercial products new polymers and copolymers of potential interest for industry and design and synthesis of speciality polymers with particular structures and architectures and desired properties The book critically evaluates the most recent achievements reported in this field and outlines the modern trends on the research and application of the catalytic processes for cycloolefin polymerization For the first time comprehensive information about the published data on the subject up to now is provided for both academic and industrial researchers working in the areas of polymer chemistry organic and organometallic chemistry surface science and catalysis petrochemistry and chemical engineering This stimulating book offers an enlightening introduction and a quick documentation on the subject as well as a solid background in this field Moreover the work offers a wealth of useful information for specialists applying polymers in various scientific and industrial areas

*Novel Metathesis Chemistry: Well-Defined Initiator Systems for Specialty Chemical Synthesis, Tailored Polymers and Advanced Material Applications* Y. Imamoglu, L. Bencze, 2012-12-06 A comprehensive discussion of the theory practice and application of catalytically active transition metal species and their application in the production of specialist polymeric materials The material is presented in a progressive manner suitable for non experts and those seeking an introduction to the field The bibliographies supplied are complete and up to date making the book an indispensable guide to the primary literature for the more theoretical background to the topics discussed After a comprehensive discussion of initiating systems for speciality chemical synthesis the book goes on to deal with a wide range of topics in materials science including alkenamers polyacetylenes industrial applications and liquid rocket engine fuels

Alkene Metathesis in Organic Synthesis Alois Fuerstner, 2003-07-01

Organometallic chemistry is a well established research area at the interface of organic and inorganic chemistry In recent

years this field has undergone a renaissance as our understanding of organometallic structure properties and mechanism has opened the way for the design of organometallic compounds and reactions tailored to the needs of such diverse areas as medicine biology materials and polymer sciences and organic synthesis For example in the development of new catalytic processes organometallic chemistry is helping meet the challenge to society that the economic and environmental necessities of the future pose As this field becomes increasingly interdisciplinary we recognize the need for critical overviews of new developments that are of broad significance This is our goal in starting this new series Topics in Organometallic Chemistry 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 Topics in Organometallic Chemistry differs from existing review series in that each volume is thematic giving an overview of an area that has reached a stage of maturity such that coverage in a single review article is no longer possible Furthermore the treatment addresses a broad audience of researchers who are not specialists in the field starting at the graduate student level Discussion of possible future research directions in the areas covered by the individual volumes is welcome

### **Green Metathesis Chemistry**

Valerian Dragutan, Albert Demonceau, Ileana Dragutan, Eugene Sh. Finkelshtein, 2009-09-30 An outstanding international scientific event in the field of metathesis chemistry the NATO ASI Green Metathesis Chemistry Great Challenges in Synthesis Catalysis and Nanotechnology has been recently organized in Bucharest Romania July 21 August 2 2008 Numerous renowned scientists young researchers and students convened for two weeks to present and debate on the newest trends in alkene metathesis and identify future perspectives in this fascinating area of organic organometallic catalysis and polymer chemistry with foreseen important applications in materials science and technology Following the fruitful practice of NATO Advanced Study Institutes selected contributions covering plenary lectures short communications and posters have been compiled in this special volume dedicated to this successful convention on green metathesis chemistry General interest was primarily focused on relevant green chemistry features related to all types of metathesis reactions RCM CM enyne metathesis ADMET and ROMP Diverse opportunities for green and sustainable technologies and industrial procedures based on metathesis have been identified Largely exemplified was the utility of this broadly applicable strategy in organic synthesis for accessing natural products and pharmaceuticals and also its ability to fit in the manufacture of smart and nanostructured materials self assemblies with nanoscale morphologies macromolecular engineering

Silicon Polymers Aziz M. Muzafarov, 2010-09-22  
Modern Synthetic and Application Aspects of Polysilanes An Underestimated Class of Materials by A Feigl A Bockholt J Weis and B Rieger Conjugated Organosilicon Materials for Organic Electronics and Photonics by Sergei A Ponomarenko and Stephan Kirchmeyer Polycarbosilanes Based on Silicon Carbon Cyclic Monomers by E Sh Finkelshtein N V Ushakov and M L Gringolts New Synthetic Strategies for Structured Silicones Using B C<sub>6</sub>F<sub>5</sub> 3 by Michael A Brook John B Grande and François Ganachaud Polyhedral Oligomeric Silsesquioxanes with Controlled Structure Formation and Application in New Si Based

Polymer Systems by Yusuke Kawakami, Yuriko Kakihana, Akio Miyazato, Seiji Tateyama, and Md Asadul Hoque      **Transition Metal-Catalyzed Carbene Transformations** Jianbo Wang, Chi-Ming Che, Michael P. Doyle, 2022-05-16 Presents an up to date overview of the rapidly growing field of carbene transformations. Carbene transformations have had an enormous impact on catalysis and organometallic chemistry. With the growth of transition metal catalyzed carbene transformations in recent decades, carbene transformations are today an important compound class in organic synthesis as well as in the pharmaceutical and agrochemical industries. Edited by leading experts in the field, *Transition Metal Catalyzed Carbene Transformations* is a thorough summary of the most recent advances in the rapidly expanding research area. This authoritative volume covers different reaction types such as ring forming reactions and rearrangement reactions, details their conditions and properties, and provides readers with accurate information on a wide range of carbene reactions. Twelve in depth chapters address topics including carbene C-H bond insertion in alkane functionalization, the application of engineered enzymes in asymmetric carbene transfer, progress in transition metal catalyzed cross coupling using carbene precursors, and more. Throughout the text, the authors highlight novel catalytic systems, transformations, and applications of transition metal catalyzed carbene transfer. Highlights the dynamic nature of the field of transition metal catalyzed carbene transformations. Summarizes the catalytic radical approach for selective carbene cyclopropanation, high enantioselectivity in X-H insertions, and bio inspired carbene transformations. Introduces chiral N-N dioxide and chiral guanidine based catalysts and different transformations with gold catalysis. Discusses approaches in cycloaddition reactions with metal carbenes and polymerization with carbene transformations. Outlines multicomponent reactions through gem difunctionalization and transition metal catalyzed cross coupling using carbene precursors. *Transition Metal Catalyzed Carbene Transformations* is essential reading for all chemists involved in organometallics, including organic and inorganic chemists, catalytic chemists, and chemists working in industry.

**Late Transition Metal Polymerization Catalysis** Bernhard Rieger, Lisa Saunders Baugh, Smita Kacker, Susanne Striegler, 2006-03-06 At the start of the 1950s, Ziegler and Natta discovered that simple metallocene catalysts are capable of transforming olefins into linear polymers with highly ordered structures. This pioneering discovery was recognized with a Nobel Prize in 1963. In the 80s and 90s, the development of molecular defined metallocenes led to a renaissance for non polar polyolefin materials. Designer catalysts allowed a greater precision in defining properties of the material. The past 10 years have seen the discovery of new catalysts based on late transition metals which allow the combination of polar monomers with non polar olefins and thus lead to innovative materials. Here, the world's leading authors from industry and academia describe the latest developments in this fascinating field for the first time in such comprehensive detail. In so doing, they introduce readers systematically to the basic principles and show how these new catalysts can effectively be used for polymerization reactions. This makes the book an ideal and indispensable reference for specialists, advanced students, and scientists of various disciplines dealing with research into catalysts and materials science.      **Metal**

**Oxides** J.L.G. Fierro, 2005-08-24 The chemistry of metals has traditionally been more understood than that of its oxides As catalytic applications continue to grow in a variety of disciplines Metal Oxides Chemistry and Applications offers a timely account of transition metal oxides TMO one of the most important classes of metal oxides in the context of catalysis The

Olefin Metathesis and Polymerization Catalysts Yavuz Imamogammalu, Birgül Zümreogammalu-Karan, Allan J. Amass, 1990-11-30 Proceedings of the NATO Advanced Study Institute Ak ay Turkey September 10 22 1989 Handbook of Transition Metal Polymerization Catalysts Ray Hoff, 2018-04-20 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 **Organometallic Chemistry and Catalysis** Didier Astruc, 2007-08-14 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 provides 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 Carbene Chemistry Guy Bertrand, 2002-05-14 Highlights recent discoveries in the development of rapid kinetic techniques that allow for direct visualization and state of the art computational methods Olefin Metathesis and Ring-opening Polymerization of Cyclo-olefins Valerian Drăguțan, Alexandru T. Balaban, Mihai Dimonie, 1985 **Hydrocarbon Chemistry** George A. Olah, Árpád Molnár, 2003-09-10 Hydrocarbons and their transformations play major roles in chemistry as raw materials and sources of energy Diminishing petroleum supplies regulatory problems and environmental concerns constantly challenge chemists to rethink and redesign the industrial applications of hydrocarbons Written by Nobel Prize winner George Olah and hydrocarbon expert r p d Moln r the completely revised and expanded Second Edition of Hydrocarbon Chemistry provides an unparalleled contemporary assessment of the field presenting basic concepts current research and future applications Hydrocarbon Chemistry begins by discussing the general aspects of hydrocarbons the separation of hydrocarbons from natural sources and the synthesis from C1 precursors with recent developments for possible future applications Each successive chapter deals with a specific type of hydrocarbon transformation The Second Edition includes a new section on the chemical reduction of carbon dioxide focusing on catalytic ionic electrocatalytic photocatalytic and ezymatic reductions



as well as a new chapter on new catalysts and activation methods combinatorial chemistry and environmental chemistry Other topics covered include Major processes of the petrochemical industry such as cracking reforming isomerization and alkylation Derivation reactions to form carbon heteroatom bonds Hydrocarbon oxidations Metathesis Oligomerization and polymerization of hydrocarbons All chapters have been updated by adding sections on recent developments to review new advances and results Essential reading for practicing scientists in industry polymer and catalytic chemists as well as researchers and graduate students Hydrocarbon Chemistry Second Edition remains the benchmark text in its field

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