Controlled And Living Polymerizations From Mechanisms To Applications

-This book highlights dynamic developments in polymer synthesis, focusing on synthetic techniques that yield new biomedically relevant polymers, macromolecular super-structures, and biopolymers for surface modification. An added emphasis deals with characterizing these polymers through structure verification---

Over the last twenty years, the field of the chemistry of polymerization witnessed enormous growth through the development of new concepts, catalysts, processes etc. Examples are: non classical living polymerizations (group transfer polymerization, living carbocationic polymerization, living radical polymerization and living ring-opening metathesis polymerization (ROMP)); new catalysts (metallocenes and late transition metal catalysts for stereospecific polymerization, Schrock and Grubbs catalyst for ROMP among others) and new processes such as miniemulsion, microemulsion polymerization and dispersion polymerization (in polar solvents). Apart from the developments in the chemistry of polymerization, methods have been developed for the evaluation of highly reliable rate constants of propagation in radical as well as cationic polymerization. All these have revolutionized the field of synthetic polymer chemistry. In the book, fundamentals of both the new and old polymerization chemistry have been dealt with. The new chemistry has been given nearly equal space along with the old.

Offers new strategies to optimize polymer reactions With contributions from leading macromolecular scientists and engineers, this book provides a practical guide to polymerization monitoring. It enables laboratory researchers to optimize polymer reactions by providing them with a better understanding of the underlying reaction kinetics and mechanisms. Moreover, it opens the door to improved industrial-scale reactions, including enhanced product quality and reduced harmful emissions. Monitoring Polymerization Reactions begins with a review of the basic elements of polymer reactions and their kinetics, including an overview of stimuli-responsive polymers. Next, it explains why certain polymer and reaction characteristics need to be monitored. The book then explores a variety of practical topics, including: Principles and applications of important polymer characterization tools, such as light scattering, gel permeation chromatography, calorimetry, rheology, and spectroscopy Automatic continuous online monitoring of polymerization (ACOMP) reactions, a flexible platform that enables characterization tools to be employed simultaneously during reactions in order to obtain a complete record of multiple reaction features Modeling of polymerization reactions and numerical approaches Applications that optimize the manufacture of industrially important polymers Throughout the book, the authors provide step-by-step strategies for implementation. In addition, ample use of case studies helps readers understand the benefits of various monitoring strategies and approaches, enabling them to choose the best one to match their needs. As new stimuli-responsive and "intelligent" polymers continue to be developed, the ability to monitor reactions will become increasingly important. With this book as their guide, polymer scientists and engineers can take full advantage of the latest monitoring strategies to optimize reactions in both the lab and the manufacturing plant.

Edited by a leading authority in the field, the first book on this important and emerging topic provides an overview of the latest trends in sequence-controlled polymers. Following a brief introduction, the book goes on to discuss various synthetic approaches to sequence-controlled polymers, including template polymerization, genetic engineering and solid-phase chemistry. Moreover, monomer sequence regulation in classical polymerization techniques such as step-growth polymerization, living ionic polymerizations and controlled radical polymerizations are explained, before concluding with a look at the future for sequence-controlled polymers. With its unique coverage of this interdisciplinary field, the text will prove invaluable to polymer and environmental chemists, as well as biochemists and bioengineers.

Controlled/living Radical Polymerization

Fundamentals to Applications

Progress in ATRP, NMP, and RAFT

Anionic Polymerization

I. Mechanisms

Fundamentals of Controlled/Living Radical Polymerization

The preparation and characterization of new materials with precisely controlled macromolecular dimensions, functionalities, and decomposition, as well as with well-defined topologies, is perhaps the main focus of contemporary polymer synthesis. The best control of molecular functions can be achieved in a controlled/living polymerization -- a chain growth process without chain breaking reactions. Recently, controlled/living polymerizations have extended to radical systems which are not only commercially important, but also have the largest potential due to the availability of radically polymerizable monomers, facile copolymerization and undemanding experimental conditions. Controlled Radical Polymerization will examine recent advances in mechanistic and synthetic aspects of controlled/living radical (co)polymerization systems. Not only will this book be focused on recent progress in the dynamically developing field of controlled/living radical polymerization, but it will be a sequel to the very popular ACS Symposium Series 685, 768, and 854. The book will consist of >30 chapters separated into seven subsections: Fundamentals, Mechanism of ATRP, Mechanisms of SFRP and Degenerative Transfer Processes, Controlled Architecture by CRP, Organic-inorganic Hybrids by CRP, Biomaterials by CRP and Industrial Applications. This book targets chemists and polymer scientists in academia and in industry.

Controlled and Living PolymerizationsFrom Mechanisms to ApplicationsJohn Wiley & Sons

The living/controlled polymerisation techniques opened new vistas in polymer chemistry. The leading authorities in this field and its pioneers contributed chapters to this collective volume. The controlled polymerisation techniques have enabled preparation of polymers, copolymers, and block copolymers with predetermined molecular weights and narrow polydispersity, in which functional groups or biologically active molecules could be placed at well defined locations. They have also enabled preparation of advanced polymeric structures with precisely determined architectures and improved properties. Moreover, they have provided opportunities for preparation of novel polymeric materials from monomers, which before have not been suitable or accessible for such purposes. Properties of some of these polymeric materials may be significantly different from those of the existing ones. They provide opportunities for new applications. Several patents have already been approved for such speciality applications as, drug delivery, biocompatible surfaces, thermoplastic elastomers, moisture curable sealants, and so on. Many more products, based on polymers fabricated by the living/ controlled polymerisation techniques, will certainly emerge in such specialised areas as, nanotechnology, medical devices, "smart polymers", sensors , smart separation technologies, optical fibres and other optical applications, various biomaterials, etc.

This book comprises the contributions of several authors in the area of polymer characterization by atomic force microscopy of the polymer network structure formed in Ferroelectric Liquid Crystals Cells; polymerization by microwave irradiation method of starch/acrylic acid/acrylamide; polymerization of olefins; emulsion polymerization; ring opening polymerization; cationic polymerization of vinyl monomers ; block and graft copolymerization by controlled/living polymerization; fabrication of doped microstructures by two-photon polymerization; rheology of biomaterials; plant cell wall polymers; polyADP-Ribosylation in postfertilization and genome reprogramming . We hope that this book will help inspire readers to pursue study and research in this field.

Mechanisms, Synthesis & Applications

Complex Macromolecular Architectures

From Interesting Reaction Mechanisms to New Polymeric Materials

Synthetic Polymer Chemistry

Synthesis, Characterization, and Applications

Metal-Catalyzed Polymerization

The effect of various imperfections such as slow initiation, termination, transfer and slow exchange on kinetics, molecular weights and polydispersities in chain growth polymerizations are simulated. The simulations demonstrate that well defined polymers can be prepared in systems with chain breaking reactions. Thus, under carefully selected conditions nonliving polymerization may provide controlled polymers. On the other hand, polymers with unpredicted molecular weights, broad and even polymodal molecular weight distributions can be formed in living systems without irreversible transfer and termination. In some living systems molecular weights may stay constant or even decrease with conversion. Thus, living and controlled polymerizations should be differentiated.

This book has been designed to appeal to both chemists working in, and new to, the area of polymer synthesis. It contains detailed instructions for the preparation of a wide-range of polymers by a wide variety of different techniques, and describes how this synthetic methodology can be applied to the development of new materials. It includes details of well-established techniques,e.g. chain-growth or step-growth processes together with more up-to-date examples using methods such as atom-transfer radical polymerisation. Less-well known procedures are also included, e.g. electrochemical synthesis of conducting polymers and the preparation of liquid crystalline elastomers with highly ordered structures. Other topics covered include general polymerisation methodology, controlled/'living' polymerisation methods, the formation of cyclic oligomers during step-growth polymerisation, the synthesis of conducting polymers based on heterocyclic compounds, dendrimers, the preparation of imprinted polymers and liquid crystalline polymers. The main bulk of the text is preceded by an introductory chapter detailing some of the techniques available to the scientist for the characterisation of polymers, both in terms of their chemical composition and in terms of their properties as materials. The book is intended not only for the specialist in polymer chemistry, but also for the organic chemist with little experience who requires a practical introduction to the field.

A relatively compact, but nonetheless comprehensive, review of the most important preparative methods for the synthesis and chemical modification of polymers. The contents are subdivided according to chemical structure of the polymer backbone. Complementary emphasis is on special properties and appl

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.

Synthesis and Applications

A Practical Approach

Innovations and Outlook

Statistical, Gradient, Block and Graft Copolymers by Controlled/Living Radical Polymerizations

Synthesis, Characterization, and Self-Assembly

Handbook of Vinyl Polymers

Polymeric materials form the basis of daily life. Despite the great contribution of traditional methodologies such as anionic and radical polymerizations in preparing various functional polymers, the increasing demand for polymers with new structures and functions has inspired the development of new synthetic techniques. Many new polymerizations including click polymerization, controlled/living radical polymerization and multicomponent polymerization have been well developed. Focusing on breakthroughs and recent progress, Synthetic Polymer Chemistry provides efficient tools for the synthesis of linear and topological polymers. Chapters cover topics including fabrication of supramolecular polymers, organocatalytic synthesis and olefin co(polymerization). This title will be a valuable reference for those working in polymer chemistry, as well as students and researchers interested in opto-electronic, biological and materials sciences.

Written by a highly prestigious and knowledgeable team of top scientists in the field, this book provides an overview of the current status of controlled/living polymerization, combining the synthetic, mechanistic and application-oriented aspects. From the contents: * Anionic Vinyl Polymerization * Carbocationic Polymerization * Radical Polymerization * Coordinative Polymerization of Olefins * Ring-Opening Polymerization of Heterocycles * Ring-Opening Metathesis Polymerization * Macromolecular Architectures * Complex Functional Macromolecules * Synthesis of Block and Graft Copolymers * Bulk and Solution Structures of Block Copolymers * Industrial Applications While some of the material is based on chapters taken from the four-volume work "Macromolecular Engineering", it is completely updated and rewritten to reflect the focus of this monograph. Must-have knowledge for polymer and organic chemists, plastics technologists, materials scientists and chemical engineers.

This book presents these important facts: a) The mechanism of anionic polymerization, a more than 50-year challenge in polymer chemistry, has now become better understood; b) Precise synthesis of many polymers with novel architectures (triblock, multi-block, graft, exact graft, comb, cyclic, many armed stars with multi-components, dendrimer-like hyper-branched, and their structural mixed (co)polymers, etc.) have been advanced significantly; c) Based on such polymers, new morphological and self-organizing nano-objects and supra molecular assemblies have been created and widely studied and are considered nanodevices in the fields of nano science and technology; d) New high-tech and industrial applications for polymeric materials synthesized by anionic polymerization have been proposed. These remarkable developments have taken place in the last 15 years. Anionic polymerization continues to be the only truly living polymerization system (100 % termination free under appropriate conditions) and consequently the only one with unique capabilities in the synthesis of well-defined (i.e., precisely controlled molecular weight, nearly mono-disperse molecular weight distribution, structural and compositional homogeneity) complex macromolecular architectures. This book, with contributions from the world’s leading specialists, will be useful for all researchers, including students, working in universities, in research organizations, and in industry.

This book is focused on recent progress in the dynamically developing field of controlled/living radical polymerization. It is a sequel to ACS Symposium Series 685, 768, 854, and 944 and contains 26 chapters on mechanistic, synthetic and materials aspects of ATRP.

Controlled/living Polymerizations

The Chemistry of Radical Polymerization

Development of New Catalysts for Living Polymerizations

Renewable Starting Materials, Catalysis and Waste Reduction

Sequence-Controlled Polymers

Progress in ATRP

The design and the realisation of well defined polymer architectures has become an important goal in macromolecular science. The prerequisite for achieving this goal is the availability of controlled polymerisation reactions. Living anionic polymerisation was the first reaction fulfilling these requirements. Cationic polymerisation only came into play when it was realised that it was possible to create an equilibrium between active and dormant species with the fraction of the dormant species being far superior to that of active ones. A corresponding principle applies to controlled radical polymerisation per formed in quite a number of modes such as nitroxide mediated polymerisation (NMP), atom transfer radical polymerisation (ATRP), reversible addition frag mentation chain transfer (RAFT) or catalytic chain transfer (CCT) reactions. All of these variants of controlled radical polymerisation lead to well defined archi tectures with the particular advantage that a much larger number of monomers are suitable and the reaction conditions are much less demanding than those of living ionic polymerisation reactions. Although in controlled radical polymerisation, termination reactions cannot be excluded completely, they are limited in their extent and consequently the mol ecular weight is controlled, the polydispersity index is small and functionalities can be attached to the macromolecules. These features are indicative of the real isation of well defined polymer architectures such as block copolymers, star shaped and comb shaped copolymers.

A must-have resource that covers everything from out-of-equilibrium chemical systems and materials to dissipative self-assemblies Out-of-Equilibrium Supramolecular Systems and Materials presents a comprehensive overview of the synthetic approaches that use supramolecular bonds in various out-of-thermodynamic equilibrium situations. With contributions from noted experts on the topic, the text contains information on the design of dissipative self-assemblies that maintain their structures when fueled by an external source of energy. The contributors also examine molecules and nanoscale objects and materials that can produce mechanical work based on molecular machines. Additionally, the book explores non-equilibrium supramolecular polymers that can be trapped in kinetically stable states, as well as out-of-equilibrium chemical systems and oscillators that are important to understand the emergence of complex behaviors and, in particular, the origin of life. This important book: Offers comprehensive coverage of fields from design of dissipative self-assemblies to non-equilibrium supramolecular polymers Presents information on a highly emerging and interdisciplinary topic Includes contributions from internationally renowned scientists Written for chemists, physical chemists, biochemists, material scientists, Out-of-Equilibrium Supramolecular Systems and Materials is an indispensable resource written by top scientists in the field.

This is truly an exciting time to be in the ?eld of polymer science. Advances in polymerization methods are providing polymer scientists with the ability to specify and control polymer composition, structure, architecture, and molecular weight to a degree that was not possible just a decade ago. This, in turn, is resulting in many novel application possibilities of polymers ranging from drug delivery systems and nanolithographyto stimuli-responsivematerials and many others. In addition,many of the application areas of polymers – such as coatings, adhesives, thermoplastics, composites, and personal care – are also taking advantage of the ability to design polymersduringtheir developmentefforts. Not to forget,manyof these applications of polymers involve mixing polymers with solvents, catalysts, colorants, and many other ingredients to prepare a formulated product. However, the tuning of polymer composition and structure as well as polymer formulations to optimize the ?nal performance properties can be challenging, - pecially since in many cases several interacting variables need to be optimized simultaneously. This is where the methodologies and techniques of combinatorial and high-throughput experimentation to synthesize and characterize polymer - braries can be an invaluable approach. Simply put, a polymer library is a collection of multiple polymer samples having a systematic variation in one or more variables related to composition, structure, or process. Various methods and strategies have been explored to ef?ciently prepare a large number of polymer samples and also to screen these samples for key properties of interest.

The field of CMA (complex macromolecular architecture) stands at the cutting edge of materials science, and has been a locus of intense research activity in recent years. This book gives an extensive description of the synthesis, characterization, and self-assembly of recently-developed advanced architectural materials with a number of potential applications. The architectural polymers, including bio-conjugated hybrid polymers with poly(amino acid)s and gluco-polymers, star-branched and dendrimer-like hyperbranched polymers, cyclic polymers, dendrigraft polymers, rod-coil and helix-coil block copolymers, are introduced chapter by chapter in the book. In particular, the book also emphasizes the topic of synthetic breakthroughs by living/controlled polymerization since 2000. Furthermore, renowned authors contribute on special topics such as helical polyisocyanates, metallopolymers, stereospecific polymers, hydrogen-bonded supramolecular polymers, conjugated polymers, and polyrotaxanes, which have attracted considerable interest as novel polymer materials with potential future applications. In addition, recent advances in reactive blending achieved with well-defined end-functionalized polymers are discussed from an industrial point of view. Topics on polymer-based nanotechnologies, including self-assembled architectures and suprastructures, nano-structured materials and devices, nanofabrication, surface nanostructures, and their AFM imaging analysis of hetero-phased polymers are also included. Provides comprehensive coverage of recently developed advanced architectural materials Covers hot new areas such as o click chemistry o chain walking o polyhomologation o ADMET Edited by highly regarded scientists in the field Contains contributions from 26 leading experts from Europe, North America, and Asia Researchers in academia and industry specializing in polymer chemistry will find this book to be an ideal survey of the most recent advances in the area. The book is also suitable as supplementary reading for students enrolled in Polymer Synthetic Chemistry, Polymer Synthesis, Polymer Design, Advanced Polymer Chemistry, Soft Matter Science, and Materials Science courses. Color versions of selected figures can be found at www.wiley.com/go/hadjichristidis

Introduction of Living Polymerization. Living And/or Controlled Polymerization

Polymers for Biomedicine

Handbook of Polymer Synthesis

Polymer Libraries

From Fundamentals to Applications

This unified presentation of cationic polymerization discusses initiation, propagation, transfer, and termination in cationic polymerizations of alkenes and heterocycles. It also elucidates the mechanisms of the reactions involved in all carbocationic and ring-opening polymerizations. It is written by internationally acclaimed experts in their respective fields.

Provides an in-depth history, description, and mechanistic understanding of each of the controlled/living radical polymerization techniques and practical details necessary to carry out the reactions.
The importance of polymer microstructure is manifested in nature, where the precisely regulated monomer sequence in biomacromolecules enables their controlled folding and assembly to afford vital biological functions. In the pursuit of man-made materials with sophisticated properties, the field of polymer chemistry has developed rapidly to enable the synthesis of polymers with controlled microstructures. Specifically, living polymerization techniques, such as ring-opening metathesis polymerization (ROMP), enable excellent control over polymer molecular weight, composition, and architecture. ROMP is driven primarily by the release of ring strain in cyclic olefin monomers, but surprisingly few studies have been performed on the ROMP of cyclopropenes (CPEs), the most strained monocyclic olefins. In 2015, our group discovered that a class of 1,1-disubstituted CPE undergoes selective single addition to Grubbs third generation catalyst. Monomers which undergo single addition are extremely rare for chain-growth polymerizations and are particularly useful for manipulating the monomer sequence in a polymer. As such, we focused our research efforts on discovering other CPEs that can undergo single addition and uncovering the mechanism and role of their substituents. We have synthesized a library of CPEs with various disubstitution patterns and substituents and systematically investigated their reactivity with Grubbs catalyst. We have found that 1,1-disubstitution of CPE is crucial for both preserving the stability of the propagating chain end and tuning the metathesis reactivity from living polymerization to single addition. The distinct reactivities stemmed from differences in sterics and/or chelation at the Ru alkylidene from C1 substituents after a single CPE ring-opening event, affecting the barrier to propagation. We have utilized the single addition reactivity of CPEs to synthesize alternating copolymers with diverse side chain and backbone functionalities from alternating ROMP of CPE with low-strain cyclic olefins. Recently, we have developed a strategy to precisely place discrete functionalities and side chains via ring-opened CPEs at pre-determined locations along a living ROMP polymer chain, with control over the location and number incorporated. This advance in polymer chemistry opens many exciting opportunities to manipulate the functionalities along well-controlled polymer chains for understanding the effects of their placement and sequence on polymer behaviors, controlling polymer folding/assembly, as well as synthesizing polymers with more complex nonlinear architectures with precision. Our group also recently reported a unique polymechanophore system, polyladderene, that undergoes force-triggered rearrangement into semi-conducting, insoluble polyacetylene. A notable feature in the design was the terminal strained cyclobutene on ladderene that allowed rapid ROMP. We have developed synthetic procedures to prepare triblock copolymers containing mechanically active polyladderene, since block copolymers can self-assemble in solution and bulk and facilitate incorporation of polyladderene with common polymers to impart the dramatic stress-response of polyladderene to diverse materials.
This book commences with a general introduction outlining the basic concepts of radical polymerization. This is followed by a chapter on radical reactions that is intended to lay the theoretical ground-work for the succeeding chapters on initiation, propagation and termination.
Cationic Ring-Opening Polymerization of Heterocyclic Monomers
Advances in Controlled/living Radical Polymerization
Controlled and Living Polymerizations
Synthesis of Controlled Polymeric Structures Through Living Polymerizations and Related Processes
From Mechanisms to Applications
Cationic Polymerizations

Synthetic polymers have revolutionized the modern world. The synthesis of these new materials has relied heavily on the development of new catalytic methods. Remarkable advances have been reported over the past twenty years concerning development of homogeneous olefin polymerization catalysts. Single-site catalysts are now available that are unparalleled in all of polymer chemistry concerning the detailed control of macromolecular stereochemistry. Despite years of fervent research, very few catalytic systems are available for living/controlled polymerization of olefins. While various methods for living anionic, cationic, and radical-based polymerizations have been exploited for the synthesis of complex polymer architectures, the lack of methodology concerning olefin polymerization has limited the development of new polyolefin-based materials.

(Co)polymers prepared via free radical mechanism, together withpolyolefins, comprise the largest portion of the commodity plasticsindustry and are also used for preparation of many specialtymaterials. Handbook of Radical Polymerization provides a concisesource of information on mechanisms, synthetic techniques, andcharacterization methods and addresses future trends for polymersmade by free radical intermediates. A one-stop, at-your-fingertips source of information forstudents, researchers, technologists, and industrial managers, theHandbook functions as a single reference of the conventional andcontrolled/living radical polymerization methods. Two experteditors collect and present historical background of the technique,basic information regarding various free radical polymerizationsystems, and state-of-the-art experimental techniques andindustrial applications. Chapters written by internationallyacclaimed experts in their respective fields include: Theory of Radical Reactions The Kinetics of Free Radical Polymerization Industrial Applications and Processes Nitroxide Mediated Living Radical Polymerization Atom Transfer Radical Polymerization Control of Free Radical Polymerization by Chain TransferMethods Macromolecular Engineering by Controlled RadicalPolymerization Guaranteed to have a long shelf life, the Handbook of RadicalPolymerization promises to be an indispensable resource forchemists, chemical engineers, material scientists, and graduatestudents in the field, as well as a valuable addition toindustrial, academic, and government libraries.

Designing polymers and developing polymerization processes that are safe, prevent pollution, and are more efficient in the use of materials and engergy is an important topic in modern chemistry. Today, green polymer research can be seen increasingly in academia nd industry. It tackles all aspects of polymers and polymerization - everything from chemical feedstocks, synthetic pathways, and reaction media to the nature of the final polymer as related to its inherent nontoxicity or degradability. This book summarizes and evaluates the latest developments in green polymerization methods. Specifically, new catalytic methods and processes which incorporate renewable resources will be discussed by leading experts in the field of polymer chemistry. This book is a must-have for Polymer Chemists, Chemists Working with/on Organometallics, Biochemists, Physical Chemists, Chemical Engineers, Biotechnologists, Materials Scientists, and Catalytic Chemists.

This book examines recent progress in controlled/living radical polymerization. The volume focuses on three synthetic methods: atom transfer radical polymerization, nitroxide mediated polymerization and degenerative transfer via addition fragmentation. In addition, the volume covers the preparation and characterization of many never before seen materials using ATRP, NMP and RAFT.

Controlled/Living Radical Polymerization
From Synthesis to Materials
Nanocomposite Structures and Dispersions
Radical Polymerization, Process, and Technology, Second Edition
Out-of-Equilibrium (Supra)molecular Systems and Materials
Polymerization

This new book covers the synthetic as well application aspects of functional polymers. It highlights modern trends in the field and showcases the recent characterization techniques that are being employed in the field of polymer science. The chapters are written by top-notch scientists who are internationally recognized in the field. The chapters will highlight the modern trend in the field.
This book meets the long-felt need for a reference on ferrocenes with the focus on catalysis. It provides a thorough overview of the synthesis and characterization of different types of chiral ferrocene ligands, their application to various catalytic asymmetric reactions, and versatile chiral materials as well as drug intermediates synthesized from them. Written by the "who's who" of ferrocene catalysis, this is a guide to the design

of new ferrocene ligands and synthesis of chiral synthetic intermediates, and will thus be useful for organic, catalytic and synthetic chemists working in academia, industrial research or process development.
Presents new developments in controlled/living radical polymerization in three areas: atom transfer radical polymerization (ATRP), nitroxide mediated polymerization (NMP), and reversible addition-fragmentation transfer (RAFT). Also includes synthesis and characterization of many new materials.
Nanocomposite Structures and Dispersions deals with the preparation of gelled, branched and crosslinked nanostructured polymers in the solution free radical polymerization and controlled/living radical polymerization and polymer and composite nanoparticles and nanostructures in disperse systems, the kinetics of direct and inverse disperse polymerizations (microemulsion, miniemulsion, emulsion, dispersion and suspension polymerization), the bottom-up approach building of functionalized nanoparticles, modelling of radical microemulsion polymerization, the characterization of traditional and non-traditional polymer dispersions, the collective properties of nanomaterials and their (bio)applications. This book is designed to bridge that gap and offers several unique features. First, it is written as an introduction to and survey of nanomaterials with a careful balance between basics and advanced topics. Thus, it is suitable for both beginners and experts, including graduate and upper-level undergraduate students. Second, it strives to balance the colloidal aspects of nanomaterials with physical principles. Third, the book highlights nanomaterial based architectures including composite or hybrid conjugates rather than only isolated nanoparticles. A number of ligands have been utilized to biodecorate the polymer and composite nanocarriers. Finally, the book provides an in depth discussion of important examples of reaction mechanisms of bottom-up building of functionalized nanoparticles, or potential applications of nanoarchitectures, ranging from physical to chemical and biological systems. Free radical (controlled) polymerization, branching, crosslinking and gelling Kinetics and mechanism of polymer nanoparticles formation Modelling of radical polymerization in disperse systems Polymer, composite and metal nanoparticles, nanostructures and nanomaterials Smart nanostructures, biodecorated particles, nanocarriers and therapeutics
Living and Controlled Polymerization
Controlled/"Living" polymerization studies of 6, 8-dioxabicyclo[3.2.1]octane
A. Synthesis of Block Copolymers with Bicyclic Acetals by Cationic Ring Opening Polymerization : B. Synthesis and Study of Tetradentate Ligands Coordinated to Cu(I) and Cu(II) for Use as ATRP Catalysts
Fundamentals of Polymerization
Handbook of Radical Polymerization
Construction of Stimuli-Responsive Polymers and Polymer Networks Using Controlled, Living Polymerizations and Highly Efficient Organic Reactions

Radical polymerization is one of the most widely used means of producing vinyl polymers, supporting a myriad of commercial uses. Maintaining the quality of the critically acclaimed first edition, the Handbook of Vinyl Polymers: Radical Polymerization, Process, and Technology, Second Edition provides a fully updated, single-volume source on the chemistry, technology, and applications of vinyl polymers. Emphasizes radical initiating systems and mechanisms of action... Written by renowned researchers in the field, this handbook is primarily concerned with the physical and organic chemistry of radical vinyl polymerization. The authors survey the most recent advances, processing methods, technologies, and applications of free radical vinyl polymerization. The book features thorough coverage of polymer functionalization, photo initiation, block and graft copolymers, and polymer composites. Analyzes living/controlled radical polymerization, one of the latest developments in the field... Combining fundamental aspects with the latest advances, processing methods, and applications in free radical vinyl polymerization and polymer technology, this invaluable reference provides a unified, in-depth, and innovative perspective of radical vinyl polymerization.
Synthesis, Characterization, and Properties of the Respective Polymers and Copolymers
Design, Synthesis, and Applications
Functional Polymers
Monitoring Polymerization Reactions
Dispersed Systems
Polymer Chemistry:A Practical Approach