By Charles E Carraher Jr Carrahers Polymer Chemistry Ninth Edition 9th Edition Hardcover

Most of the available texts for polymer chemistry are written for graduate students, foregoing some of the concepts that are the basis for understanding polymers. Building on the core elements of organic and physical chemistry, Introduction to Polymer Chemistry provides an articulate, well-rounded presentation of the principles and applications for natural, synthetic, inorganic, and organic polymers. The book organizes its organic-intensive chapters in the front, allowing greater time for students and teachers to become familiar with the topic before embarking on physical aspects. Relating to all types of polymers, the chapters examine synthesis and polymerization reactions, reactivities, techniques for characterization and analysis, energy absorption and thermal conductivity, physical and optical properties, and more. Each chapter contains up-to-date problems, learning summaries, practical glossaries, and recommended Web sites for further study. The author uses compelling examples from real-world applications that underscore the impact of polymers on society and emphasize the increasing role of polymers for resolving worldwide health challenges such as clean and abundant water, food preservation, clean air, and clean energy. Placing less emphasis on physical topics, Introduction to Polymer Chemistry contains sufficient coverage of kinetics and thermodynamics to qualify as an advanced course for the American Chemical Society (ACS) Committee on Professional Training approval process. It also fulfills the advanced course requirements of the ACS for the chemistry major, offering a solutions manual for qualifying course adoptions.

As the first polymer book to receive the CHOICE Outstanding Academic Title distinction (2007), Introduction to Polymer Chemistry provided undergraduate students with a much-needed, well-rounded presentation of the principles and applications of natural, synthetic, inorganic, and organic polymers. With an emphasis on the environment and green chemistry and materials, this second edition continues that tradition, offering detailed coverage of natural and synthetic giant molecules, inorganic and organic polymers, elastomers, adhesives, coatings, fibers, plastics, blends, caulks, composites, and ceramics. Using simple fundamentals, the author shows how the basic principles of one polymer group can be applied to all of the other groups. He covers synthesis and polymerization reactions, reactivities, techniques for characterization and analysis, energy absorption and thermal conductivity, physical and optical properties, and practical applications. This edition also addresses environmental concerns and green polymeric materials, including biodegradable polymers and microorganisms for synthesizing materials. Brief case studies are woven within the text as historical accounts to illustrate various developments and the societal and scientific contexts in which these changes occurred. Introduction to Polymer Chemistry, Second Edition remains the premier text for understanding the behavior of polymers while offering new material on environmental science. Building on undergraduate work in foundational courses, the text fulfills the American Chemical Society Committee on Professional Training (ACS CPT) in-depth course requirement. It also provides a test bank with upon qualifying course adoption.

BACKGROUND Polysiloxanes have chains constructed of alternately arranged silicon and oxygen atoms with organic groups attached to the silicon atoms. This structure gives them a unique combination of properties that hold great interest for a host of practical applications. Although they have been known and manufactured for many years, their applications continue to expand rapidly and this boosts progress in the generation of new and modified polysiloxanes. Polysiloxanes constitute the oldf"" known class of silicon-based polymers and the broadest one when viewed in terms of the variety of structures differing in topology and the constitution of organic substituents. There are also many and various types of siloxane copolymers, some of purely siloxane structure and others of siloxane-organic composition. There is no doubt that polysiloxanes are the most technologically important silicon-based polymers. The broad class of model materials known as silicones is based on polysiloxanes. They are also the best known, as most research in the area of silicon polymers has for many years been directed towards the synthesis of new polysiloxanes, to understanding their properties and to extending their applications.

With such a wide diversity of properties and applications, is it any wonder that industry and academia have such a fascination with polymers? A solid introduction to such an enormous and important field is critical to the modern polymer scientist-to-be, but most of the available books do not stress practical problem solving or include recent advances. Serving as the polymer book for the new millennium, Introduction to Polymer Science and Chemistry: A Problem Solving Approach unites the fundamentals of polymer science and polymer chemistry in a seamless presentation. Emphasizing polymerization kinetics, the author uses a unique question-and-answer approach when developing theory or introducing new concepts. The first four chapters introduce polymer science, focusing on physical and molecular properties, solution behavior, and molecular weights. The remainder of the book explores polymer chemistry, devoting individual, self-contained chapters to the main types of polymerization reactions: condensation; free radical; ionic; coordination; and ring-opening. It introduces recent advances such as supramolecular polymerization, hyperbranching, photoemulsion polymerization, the grafting-from polymerization process, polymer brushes, living/controlled radical polymerization, and immobilized metallocene catalysts. With numerical problems accompanying the discussion at every step along with numerous end-of-chapter exercises, Introduction to Chemical Polymer Science: A Problem Solving Approach is an ideal introductory text and self-study vehicle for mastering the principles and methodologies of modern polymer science and chemistry.

For there is hope of a tree, If it be cut down, That it will sprout again And that the tender branch Thereof will not cease. Job XIV (7) Mankind has been blessed with a multitude of resources. In the beginning he utilized almost soley replenishable items such as vegetation and animal protein, for both nourishment and shelter. Gradually, such metals as copper and iron were developed and replaced wood as a material of construction. Cement and glass, although more plentiful than other minerals, also replaced the use of growing sub stances. Coal and oil became the primary sources of heat and power. Closer to the focus of this book, petroleum products began to replace the vegetable oils, tannin, wool, cotton, leather, silk, rubber, etc. in a host of applications. Surely, it was argued, the new materials did the job better and cheaper. What they didn't say is that soon we would run out of oil. In any case, research on growing natural products, now called renewable resources, slowed, and these industries sought only to maintain their status quo. The 20th Century saw an unprecedented emphasis and dependence on nonrenewable resources as energy sources (petroleum, coal, ura nium) and the fabric of technology (drugs, clothing, shelter, tires, computer parts). The predawn of the 21st Century brings a reali zation that a cyclic shift back towards the use of renewable re sources for technological application is in order.

An introduction to the synthetic, natural, organometallic and inorganic polymers - integrating scientific principles with modern applications. This fifth edition is based on the American Chemical Society's Committee on Professional Training guidelines with an enhanced section on biologically essential macromolecules and the biological flow of information. An Exam Question booklet is available to instructors.

Introduction to Polymer Chemistry provides undergraduate students with a much-needed, well-rounded presentation of the principles and applications of natural, synthetic, inorganic, and organic polymers. With an emphasis on the environment and green chemistry and materials, this fourth edition continues to provide detailed coverage of natural and synthetic giant molecules, inorganic and organic polymers, elastomers, adhesives, coatings, fibers, plastics, blends, caulks, composites, and ceramics. Building on undergraduate work in foundational courses, the text fulfills the American Chemical Society Committee on Professional Training (ACS CPT) in-depth course requirement

Continuing in the tradition of excellence set by prior editions, this completely updated and enlarged Fourth Edition of Seymour/Carraher's Polymer Chemistry helps students expand their knowledge of general, organic, analytical, and physical chemistry - presenting a holistic approach to inorganic, synthetic, and biological polymers. The Fourth Edition covers important topics of current interest in polymer science, including DNA profiling...recycling codes...smart materials...liquid crystals...ionomers...composites...dendrites...soluble stereoregulating catalysis...additives...monomer synthesis...kinetics...polyethylene...high performance materials...molecular weight concepts...and more.

The Second Edition of Giant Molecules presents an introductory textbook on large molecules that exhibit specific physical and biological properties related to their size, orientation, and environment, making this subject accessible to students from high school to universities. Written by Charles Carraher, author of more than forty books on the subject, this up-to-date guide presents material in an integrated fashion, marrying fundamentals with illustrative applications. The text assumes no previous formal scientific training, and includes new and updated questions and answers, a glossary of relevant terms, bibliographies, visual aids, and related Web links in every chapter. Giant Molecules, Second Edition will appeal to individuals who have a personal or professional interest in polymers, as well as to college chemistry and materials science students who study polymers.

The term biomimetic is comparatively new on the chemical scene, but the concept has been utilized by chemists for many years. Furthermore, the basic idea of making a synthetic material that can imitate the func tions of natural materials probably could be traced back into antiquity. From the dawn of creation, people have probably attempted to duplicate or modify the activities of the natural world. (One can even find allusions to these attempts in the Bible; e. g. , Genesis 30.) The term "mimetic" means to imitate or mimic. The word "mimic" means to copy closely, or to imitate accurately. Biomimetic, which has not yet entered most dictionaries, means to imitate or mimic some specific bio logical function. Usually, the objective of biomimetics is to form some useful material without the need of utilizing living systems. In a simi lar manner, the term biomimetic polymers means creating synthetic poly mers which imitate the activity of natural bioactive polymers. This is a major advance in polymer chemistry because the natural bioactive polymers are the basis of life itself. Thus, biomimetic polymers imitate the life process in many ways. This present volume delineates some of the recent progress being made in this vast field of biomimetic polymers. Chemists have been making biomimetic polymers for more than fifty years, although this term wasn't used in the early investigations.

Introduction to Polymer ChemistryCRC Press

Natural polymers, such as proteins, starch, cellulose, hevea rubber, and gum which have been available for centuries, have been applied as materials for food, leather, sizings, fibers, structures, waterproofing, and coatings. During the past century, the use of both natural and syn thetic polymers has been expanded to include more intricate applications, such as membranes, foams, medicinals, conductors, insulators, fibers, films, packaging and applications requiring high modulus at elevated temperatures. The topics in this symposium which are summarized in this book are illustrative of some of the myriad applications of these ubiquitous mater ials. As stated in forecast in the last chapter in this book, it is cer tain that revolutionary applications of polymers will occur during the next decades. Hopefully, information presented in other chapters in this book will catalyze some of these anticipated applications. It is appropriate that these reports were presented at an American Chemical Society Polymer Science and Engineering Division Award Symposium honoring Dr. O.A. Battista who has gratifying to note that Phillips Pet roleum Company, which has paved the way in applications of many new poly mers, is the sponsor of this important award. We are all cheerfully expressing our thanks to this corporate spon sor and to Distinguished Professor Raymond B. Seymour of the University of Southern Mississippi who served as the organizer of this symposium and editor of this important book.

The 75th Anniversary Celebration of the Division of Polymeric Materials: Science and Engineering of the American Chemical Society, in 1999 sparked this third edition of Applied Polymer Science with emphasis on the developments of the last few years and a serious look at the challenges and expectations of the 21st Century. This book is divided into six sections, each with an Associate Editor responsible for the contents with the group of Associate Editors acting as a board to interweave and interconnect various topics and to insure complete coverage. These areas represent both traditional areas and emerging areas, but always with coverage that is timely. The areas and associated chapters represent vistas where PMSE and its members have made and are continuing to make vital contributions. The authors are leaders in their fields and have graciously donated their efforts to encourage the scientists of the next 75 years to further contribute to the well being of the society in which we all live. Synthesis, characterization, and application are three of the legs that hold up a steady table. The fourth is creativity. Each of the three strong legs are present in this book with creativity present as the authors were asked to look forward in predicting areas in need of work and potential applications. The book begins with an introductory history chapter introducing readers to PMSE. The second chapter introduces the very basic science, terms and concepts critical to polymer science and technology. Sections two, three and four focus on application areas emphasizing emerging trends and applications. Section five emphasizes the essential areas of characterization. Section six contains chapters focusing of the synthesis of the materials.

This series provides a useful, applications-oriented forum for the next generation of macromolecules and materials. Volume 4 provides useful descriptions of Group IV metals and their applications, including silicon-, organogermanium-, organotin-, and organolead-containing polymers. A high-quality team of macromolecular experts from around the world have put together these leading macromolecule titles.

Metal- and metalloid-containing macromolecules are defined as largemolecules (i.e., polymers, DNA, proteins) that contain a metal ormetalloid group affiliated with the molecule. The first volume inthis series consists of a number of reviews of the field, to givethe reader a background to build upon. Compiled by an all-star castof macromolecular experts, this guide: Provides useful descriptions of applications for the reader toapply in his/her research into materials, polymers, andmedicine/drug development. Covers non-linear optical materials, speciality magneticmaterials, liquid crystals, anticancer and antiviral drugs,treatment of arthritis, antibacterial drugs, antifouling materials,treatment of certain vitamin deficiencies, electrical conductorsand semiconductors, piezoelectronic materials, electrodes, UVabsorption applications, super-strength materials, speciallubricants and gaskets, selective catalytic and multisite catalyticagents.

Phase transfer catalysis or interfacial catalysis is a syn thetic technique involving transport of an organic or inorganic salt from a solid or aqueous phase into an organic liquid where reaction with an organic-soluble substrate takes place. Over the past 15 years there has been an enormous amount of effort invested in the development of this technique in organic synthe sis. Several books and numerous review articles have appeared summarizing applications in which low molecular weight catalysts are employed. These generally include either crown ethers or onium salts of various kinds. While the term phase transfer catalysis is relatively new, the concept of using a phasetrans fer agent (PTA) is much older~ Both Schnell and Morgan employed such catalysts in synthesis of polymeric species in the early 1950's. Present developments are really extensions of these early applications. It has only been within the last several years that the use of phase transfer processes have been employed in polymer synthesis and modification. Similarly, the use of polymer-bound phase transfer agents is also a recent development. These and related areas have nonetheless enjoyed explosive growth as mea sured by the number of publications and the variety of applica tions which have appeared. Several reviews dealing with these l 6 polymer-related investigations have been published.

Proceedings of an ACS-PMSE Division Symposium held in Orlando, Florida, August 21-25, 1996

Updated to reflect a growing focus on green chemistry in the scientific community and in compliance with the American Chemical Societye(tm)s Committee on Professional Training guidelines, Carrahere(tm)s Polymer Chemistry, Eighth Edition integrates the core areas that contribute to the growth of polymer science. It supplies the basic understanding of polymers essential to the training of science, biomedical, and engineering students. New in the Eighth Edition: Updating of analytical, physical, and special characterization techniques Increased emphasis on carbon nanotubes, tapes and glues, butyl rubber, polystyrene, polypropylene, polyethylene, poly(ethylene glycols), shear-thickening fluids, photo-chemistry and photophysics, dental materials, and aramids New sections on copolymers, including fluoroelastomers, nitrile rubbers, acrylonitrile-butadiene-styrene terpolymers, and EPDM rubber New units on spliceosomes, asphalt, and fly ash and aluminosilicates Larger focus on the molecular behavior of materials, including nano-scale behavior, nanotechnology, and nanomaterials Continuing to provide a user-friendly approach to the world of polymeric materials, the book allows students to integrate their chemical knowledge and establish a connection between fundamental and applied chemical information. It contains all of the elements of an introductory text with synthesis, property, application, and characterization. Special sections in each chapter contain definitions, learning objectives, questions, and additional reading, with case studies woven into the text fabric. Symbols, trade names, websites, and other useful ancillaries appear in the appendices to supplement the text.

This revolutionary and best-selling resource contains more than 200 pages of additional information and expanded discussions on zeolites, bitumen, conducting polymers, polymerization reactors, dendrites, self-assembling nanomaterials, atomic force microscopy, and polymer processing. This exceptional text offers extensive listings of laboratory exercises and demonstrations, web resources, and new applications for in-depth analysis of synthetic, natural, organometallic, and inorganic polymers. Special sections discuss human genome and protonics, recycling codes and solid waste, optical fibers, self-assembly, combinatorial chemistry, and smart and conductive materials.

Organometallic Polymers focuses on the synthesis, characterization, and potential applications of organometallic polymers. The discussion is organized around seven themes: vinyl polymerization of organometallic monomers; condensation polymerization of organometallic monomers; polymer-bound catalysts; applications of organotin polymers; developments in organosilicon polymers; phosphonitrile and sulfur nitride polymers; and coordination polymers. This book is comprised of 33 chapters and begins with a general review of polymerized vinyl monomers containing transition metals, as well as the reactivity of such monomers in addition to homo- and copolymerizations. The following chapters explore the participation of the ferrocene nucleus in the polymerization of vinylferrocene and its effect on polymer properties; thermomechanical transitions of ferrocene-containing polymers; photocrosslinkable organometallic polyesters; and supported catalysts for ethylene polymerization. The remaining sections discuss antifouling applications of various tin-containing organometallic polymers; structure and applications of polyphosphazenes and polymeric sulfur nitride; and coordination of inorganic ions to polymers. This monograph will be a useful resource for organic chemists and research workers in the field.

Metal- and metalloid-containing macromolecules are defined as large molecules (i.e., polymers, DNA, proteins) that contain a metal or metalloid group affiliated with the molecule. This volume describes what is possible with metal-containing polymers where the metal is an essential ingredient in obtaining desired optical and electronic properties. Covering applications in nonlinear optical materials, solar cells, light-emitting diodes, photovoltaic cells, field-effect transistors, chemosensing devices, and biosensing devices, this indispensible guide focuses on the photochemistry and photophysics of metal-containing polymers, with chapters by leading contributors to the core advances in this field.

This successful textbook undergoes a change of character in the third edition. Where earlier editions covered organic polymer chemistry, the third edition covers both physical and organic chemistry. Thus kinetics and thermodynamics of polymerization reactions are discussed. This edition is also distinct from all other polymer textbooks because of its coverage of such currently hot topics as photonic polymers, electricity conducting polymers, polymeric materials for immobilization of reagents and drug release, organic solar cells, organic light emitting diodes. This textbook contains review questions at the end of every chapter, references for further reading, and numerous examples of commercially important processes.

Carraher's Polymer Chemistry, Tenth Edition integrates the core areas of polymer science. Along with updating of each chapter, newly added content reflects the growing applications in Biochemistry, Biomaterials, and Sustainable Industries. Providing a user-friendly approach to the world of polymeric materials, the book allows students to integrate their chemical knowledge and establish a connection between fundamental and applied chemical information. It contains all of the elements of an introductory text with synthesis, property, application, and characterization. Special sections in each chapter contain definitions, learning objectives, questions, case studies and additional reading.

Research on metal-containing polymers began in the early 1960's when several workers found that vinyl ferrocene and other vinylic transition metal u -com plexes would undergo polymerization under the same conditions as conventional organic monomers to form high polymers which incorporated a potentially reactive metal as an integral part of the polymer structures. Some of these materials could act as semi-conducters and pos sessed one or two dimensional conductivity. Thus appli cations in electronics could be visualized immediately. Other workers found that reactions used to make simple metal chelates could be used to prepare polymers if the ligands were designed properly. As interest in homo geneous catalysts developed in the late 60's and early 70's, several investigators began binding homogeneous catalysts onto polymers, where the advantage of homo geneous catalysis - known reaction mechanisms and the advantage of heterogeneous catalysis - simplicity and ease of recovery of catalysts could both be obtained. Indeed the polymer matrix itself often enhanced the selectivity of the catalyst.

Most of the advancements in communication, computers, medicine, and air and water purity are linked to macromolecules and a fundamental understanding of the principles that govern their behavior. These fundamentals are explored in Carraher's Polymer Chemistry, Ninth Edition. Continuing the tradition of previous volumes, the latest edition provides a well-rounded presentation of the principles and applications of polymers. With an emphasis on the environment and green chemistry and materials, this edition offers detailed coverage of natural and synthetic giant molecules, inorganic and organic polymers, biomacromolecules, elastomers, adhesives, coatings, fibers, plastics, blends, caulks, composites, and ceramics. Using simple fundamentals, this book demonstrates how the basic principles of one polymer group can be applied to all of the other groups. It covers reactivities, synthesis and polymerization reactions, techniques for characterization and analysis, energy absorption and thermal conductivity, physical and optical properties, and practical applications. This edition includes updated techniques, new sections on a number of copolymers, expanded emphasis on nanotechnology and nanomaterials, and increased coverage of topics including carbon nanotubes, tapes and glues, photochemistry, and more. With topics presented so students can understand polymer science even if certain parts of the text are skipped, this book is suitable as an undergraduate as well as an introductory graduate-level text. The author begins most chapters with theory followed by application, and generally addresses the most critical topics first. He provides all of the elements of an introductory text, covering synthesis, properties, applications, and characterization. This user-friendly book also contains definitions, learning objectives, questions, and additional reading in each chapter.

Because of a lack of appreciation for his efforts in developing modern polymer science, the contributions of Hermann Staudinger were disregarded for decades. There have also been delays in recognizing the contributions of other pioneers in polymer science. Hence, it is gratifying to note that Professor Seymour chaired an American Chemical Society Symposium focusing on the contributions of these pioneers and that Kluwer Academic Publishers has published the proceedings of this important symposium. H.Mark v DEDICATION This book on Pioneers in Polymer Science is dedicated to Nobel Laureate Polymer Scientists Hermann Staudinger, Emil Fischer, Herman Mark, Paul J. Flory, Linus Pauling, Carl S. Marvel, M. Polanyi, Giulio Natta, Karl Ziegler, and Bruce Merrifield as well as to those pioneers such as J.C. Patrick, Robert Thomas, William Sparks, Maurice Huggins, Qtto Bayer, Leo Baekeland, Anselm Payer, Roger Boyer, Waldo Semon, Robert Banks, J.P. Hogan, and other pioneers who, to a large degree, were responsible for the development of the world's second largest industry. ACKNOWLEDGEMENT The editor appreciates the contribution of co-authors Herman Mark, C.H. Fisher, and G. Alan Stahl who co chaired the Symposium on Pioneers in Polymer Science at the National Meeting of the American Chemical Society at Seattle, WA in 1984 and who contributed a chapter in this book. The editor is particularly grateful to Mischa Thomas who typed this manuscript.

This high school textbook introduces polymer science basics, properties, and uses. It starts with a broad overview of synthetic and natural polymers and then covers synthesis and preparation, processing methods, and demonstrations and experiments. The history of polymers is discussed alongside the s

Never HIGHLIGHT a Book Again! Virtually all of the testable terms, concepts, persons, places, and events from the textbook are included. Cram101 Just the FACTS101 studyguides give all of the outlines, highlights, notes, and quizzes for your textbook with optional online comprehensive practice tests. Only Cram101 is Textbook Specific. Accompanys: 9781439809556 .

Although in nature the vast majority of polymers are condensation polymers, much publicity has been focused on functionalized vinyl polymers. Functional Condensation Polymers fulfills the need to explore these polymers which form an increasingly important and diverse foundation in the search for new materials in the twentyfirst century. Some of the advantages condensation polymers hold over vinyl polymers include offering different kinds of binding sites, their ability to be made biodegradable, and their different reactivities with various reagents under diverse reaction conditions. They also offer better tailoring of end-products, different tendencies (such as fiber formation), and different physical and chemical properties. Some of the main areas emphasized include dendrimers, control release of drugs, nanostructure materials, controlled biomedical recognition, and controllable electrolyte and electrical properties.

"Polymer Science and Engineering: Challenges, Needs, and Opportunities," a report issued in 1981 by the National Research Council's ad hoc Panel on Polymer Science and Engineering gives ample support for the urgent need of increased commitment to basic studies on polymers. Needs and opportunities, mentioned in the Panel's list, included polymerization methods, specialty polymers, high performance materials, and in situ (reaction injection molding) polymerization for direct conversion of monomers/oligomers to useful shapes. Clearly, in all these and several other areas, advances in polymer synthesis are needed. Whether one takes a look at the commodity or specialty polymers area or considers areas of growing needs, such as polymers for the automotive, aerospace, electronics, communications, separations, packaging, biomedical, etc., advances in polymer synthesis are needed. Polymeric materials, as they are constantly being modified and improved, fine-tuned for current and additional needs, and more readily adopted by industry and the public, will have a vastly expanding influence on everyday life. However, lack of long-term support of meaningful size for basic research on all facets of polymer chemistry and engineering, with particular emphasis on making needed advances in polymer synthesis, could well stunt the growth of high techn.ology in our country. Expanding this thought, lack of attention to basic research on polymer synthesis could help foster or insure that we won't have materials with performance profiles to meet requirements of emerging technologies and national needs, in a reasonably economic and timely fashion.

Research on metal-containing polymers began in the early 1960's when several workers found that vinyl ferrocene and other vinylic transition metal TI -complexes would undergo polymerization under the same conditions as conventional organic monomers to form high polymers which incorporated a potentially reactive metal as an integral part of the polymer structures. Some of these materials could act as semi conductors and possessed one or two dimensional conductivity. Thus applications in electronics could be visualized immediately. Other workers found that reactions used to make simple metal chelates could be used to prepare polymers if the ligands were designed properly. As interest in homogeneous catalysts developed in the late 60's and early 70's, several investigators began binding homogeneous catalysts onto polymers, where the advantage of homogeneous catalysis - known reaction mechanisms and the advantage of heterogeneous catalysis - simplicity and ease of recovery of catalysts could both be obtained. Indeed the polymer matrix itself often enhanced the selectivity of the catalyst. The first symposium on Organometallic Polymers, held at the National Meeting of the American Chemical Society in September 1977, attracted a large number of scientists interested in this field, both established investigators and newcomers. Subsequent symposia in 1977, 1979, 1983, and 1987 have seen the field mature. Hundreds of papers and patents have been published.

The first concern of scientists who are interested in synthetic polymers has always been, and still is: How are they synthesized? But right after this comes the question: What have I made, and for what is it good? This leads to the important topic of the structure-property relations to which this book is devoted. Polymers are very large and very complicated systems; their character ization has to begin with the chemical composition, configuration, and con formation of the individual molecule. The first chapter is devoted to this broad objective. The immediate physical consequences, discussed in the second chapter, form the basis for the physical nature of polymers: the supermolecular interactions and arrangements of the individual macromolecules. The third chapter deals with the important question: How are these chemical and physical structures experimentally determined? The existing methods for polymer characterization are enumerated and discussed in this chapter. The following chapters go into more detail. For most applications-textiles, films, molded or extruded objects of all kinds-the mechanical and the thermal behaviors of polymers are of pre ponderant importance, followed by optical and electric properties. Chapters 4 through 9 describe how such properties are rooted in and dependent on the chemical structure. More-detailed considerations are given to certain particularly important and critical properties such as the solubility and permeability of polymeric systems. Macromolecules are not always the final goal of the chemist-they may act as intermediates, reactants, or catalysts. This topic is presented in Chapters 10 and 11.

This ready reference is the first to collate the interdisciplinary knowledge from materials science, bioengineering and nanotechnology to give an in-depth overview of the topic. As such, it provides broad coverage of combinations between inorganic materials and such key biological structures as proteins, enzymes, DNA, or biopolymers. With its treatment of various application directions, including bioelectronic interfacing, tissue repair, porous membranes, sensors, nanocontainers, and DNA engineering, this is essential reading for materials engineers, medical researchers, catalytic chemists, biologists, and those working in the biotechnological and semiconductor industries.