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The field of polymer science has advanced and expanded considerably in recent years, encompassing broader ranges of materials and applications. In this book, Fumihiko Tanaka unifies the subject matter, pulling together research to provide an updated and systematic presentation of polymer association and thermoreversible gelation, one of the most rapidly developing areas in polymer science. Starting with a clear exposition of the fundamental laws of polymer physics, subsequent chapters discuss a new theoretical model that combines thermodynamic and rheological theory. Recent developments in polymer physics are explored, along with important case studies on topics such as self-assembly, supramolecules, thermoreversible gels and water-soluble polymers. Throughout the book, a balance is maintained between theoretical descriptions and practical applications, helping the reader to understand complex physical phenomena and their relevance in industry. This book has wide interdisciplinary appeal and is aimed at students and researchers in physics, chemistry and materials science. This sequel to A Prehistory of Polymer Science begins with the Faraday Discussion of 1935 on Polymerization. Patterson then examines the remarkable rise and establishment of polymer science after 1935 from the perspective of the emergence of strong intellectual leaders. While enough biographical detail is presented to gain an appreciation for the role played by each leader, the emphasis of this volume is on the key concepts associated with each individual and how the community embraced these leaders. This Third Edition of the classic, best-selling polymer science textbook surveys theory and practice of all major phases of polymer science, engineering, and technology, including polymerization, solution theory, fractionation and molecular-weight measurement, solid-state properties, structure-property relationships, and the preparation, fabrication and properties of commercially-important plastics, fibers, and elastomers. 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 Explains the correlation between the physical properties and structure of polymer

gels This book elucidates in detail the physics of polymer gels and reviews their unique properties that make them attractive for innumerable applications. Geared towards experienced researchers and entrants to the field, it covers rubber elasticity, swelling and shrinking, deformation and fracture of as well as mass transport in polymer gels, enabling the readers to purposefully design polymer gels fit for specific purposes. Divided into two parts, Physics of Polymer Gels starts by explaining the statistical mechanics and scaling of a polymer chains, and that of polymer solutions. It then introduces the structure of polymer gels and explains the rubber elasticity, which predicts the solid-like nature of polymer gels. Next, it describes swelling/deswelling, which can be understood by combining the rubber elasticity and the osmotic pressure of a polymer solution. Large deformation and fracture, and the diffusion of substances in polymer gels, which are essential for practical applications, are also introduced. The last half of the book contains the authors' experimental results using Tetra-PEG gels and provides readers with the opportunity to examine and compare it with the first half in order to understand how to utilize the models to experiments.

This title: * Is the first book dedicated to the physics of polymer gels * Describes in detail the properties of polymer gels and their underlying physics, facilitating the development of novel, polymer gel-based applications * Serves as a reference for all relevant polymer gel properties and their underlying physics * Provides a unified treatment of the subject, explaining the physical properties of polymer gels within a common nomenclature framework

Physics of Polymer Gels is a must-have book for experienced researchers, such as polymer chemists, materials scientists, organic chemists, physical chemists, and solid-state physicists, as well as for newcomers to the field. This book provides a unified mechanics and materials perspective on polymers: both the mathematics of viscoelasticity theory as well as the physical mechanisms behind polymer deformation processes. Introductory material on fundamental mechanics is included to provide a continuous baseline for readers from all disciplines. Introductory material on the chemical and molecular basis of polymers is also included, which is essential to the understanding of the thermomechanical response. This self-contained text covers the viscoelastic characterization of polymers including constitutive modeling, experimental methods, thermal response, and stress and failure analysis. Example problems are provided within the text as well as at the end of each chapter.

New to this edition: · One new chapter on the use of nano-material inclusions for structural polymer applications and applications such as fiber-reinforced polymers and adhesively bonded structures · Brings up-to-date polymer production and sales data and equipment and procedures for evaluating polymer characterization and classification · The work serves as a comprehensive reference for advanced seniors seeking graduate level courses, first and second year graduate students, and practicing engineers

Now in its second edition, this widely used text provides a unique presentation of today's polymer science. It is both comprehensive and readable. The authors are leading educators in this field with extensive background in industrial and academic polymer research. The text starts with a description of the types of microstructures found in polymer Discerning the properties of polymers and polymer-based materials requires a good understanding of characterization. This revised and updated text provides a comprehensive survey of characterization methods within its simple, concise chapters. Polymer Characterization: Physical Techniques, provides an overview of a wide variety of characterization methods, which makes it an excellent textbook and reference. It starts with a description of basic polymer science, providing a solid foundation from which to understand the key physical characterization techniques. The authors explain physical principles without heavy theory and give special emphasis to the application of the techniques to polymers, with plenty of illustrations. Topics covered include molecular weight determination, molecular and structural characterization by spectroscopic techniques, morphology and structural characterization by microscopy and diffraction, and thermal analysis. This edition contains a new chapter on surface analysis as well as some revised problems and solutions. The concise treatment of each topic offers even those with little prior knowledge of the subject an accessible source to relevant, simple descriptions in a well-organized format. The Handbook of Polymer Testing: Physical Methods provides virtually currently used techniques for measuring and testing the physical properties of polymers. A concise but detailed technical guide to the physical testing methods of synthetic polymers in plastics, rubbers, cellular materials, textiles, coated fabrics, and composites, the book analyses a wide array of physical parameters and features complete coverage of mechanical, optical, and electrical, and thermal properties. Topics of interest include sample preparation, time-dependent properties, coated fabrics, weathering, permeability, and nondestructive testing. Polymer Solutions: An Introduction to Physical Properties offers a

fresh, inclusive approach to teaching the fundamentals of physical polymer science. Students, instructors, and professionals in polymer chemistry, analytical chemistry, organic chemistry, engineering, materials, and textiles will find Iwao Teraoka's text at once accessible and highly detailed in its treatment of the properties of polymers in the solution phase. Teraoka's purpose in writing *Polymer Solutions* is twofold: to familiarize the advanced undergraduate and beginning graduate student with basic concepts, theories, models, and experimental techniques for polymer solutions; and to provide a reference for researchers working in the area of polymer solutions as well as those in charge of chromatographic characterization of polymers. The author's incorporation of recent advances in the instrumentation of size-exclusion chromatography, the method by which polymers are analyzed, renders the text particularly topical. Subjects discussed include: Real, ideal, Gaussian, semirigid, and branched polymer chains Polymer solutions and thermodynamics Static light scattering of a polymer solution Dynamic light scattering and diffusion of polymers Dynamics of dilute and semidilute polymer solutions Study questions at the end of each chapter not only provide students with the opportunity to test their understanding, but also introduce topics relevant to polymer solutions not included in the main text. With over 250 geometrical model diagrams, *Polymer Solutions* is a necessary reference for students and for scientists pursuing a broader understanding of polymers. *Polymer Science and Nanotechnology: Fundamentals and Applications* brings together the latest advances in polymer science and nanoscience. Sections explain the fundamentals of polymer science, including key aspects and methods in terms of molecular structure, synthesis, characterization, microstructure, phase structure and processing and properties before discussing the materials of particular interest and utility for novel applications, such as hydrogels, natural polymers, smart polymers and polymeric biomaterials. The second part of the book examines essential techniques in nanotechnology, with an emphasis on the utilization of advanced polymeric materials in the context of nanoscience. Throughout the book, chapters are prepared so that materials and products can be geared towards specific applications. Two chapters cover, in detail, major application areas, including fuel and solar cells, tissue engineering, drug and gene delivery, membranes, water treatment and oil recovery. Presents the latest applications of polymers and polymeric nanomaterials, across energy, biomedical, pharmaceutical, and environmental fields Contains detailed coverage of polymer nanocomposites, polymer nanoparticles, and hybrid polymer-metallic nanoparticles Supports an interdisciplinary approach, enabling readers from different disciplines to understand polymer science and nanotechnology and the interface between them This book is mainly concerned with building a narrow but secure ladder which polymer chemists or engineers can climb from the primary level to an advanced level without great difficulty (but by no means easily, either). This book describes some fundamentally important topics, carefully chosen, covering subjects from thermodynamics to molecular weight and its distribution effects. For help in self-education the book adopts a "Questions and Answers" format. The mathematical derivation of each equation is shown in detail. For further reading, some original references are also given. Numerous physical properties of polymer solutions are known to be significantly different from those of low molecular weight solutions. The most probable explanation of this obvious discrepancy is the large molar volume ratio of solute to solvent together with the large number of consecutive segments that constitute each single molecule of the polymer chains present as solute. Thorough understanding of the physical chemistry of polymer solutions requires some prior mathematical background in its students. In the original literature, detailed mathematical derivations of the equations are universally omitted for the sake of space-saving and simplicity. In textbooks of polymer science only extremely rough schemes of the theories and then the final equations are shown. As a consequence, the student cannot learn, unaided, the details of the theory in which he or she is interested from the existing textbooks; however, without a full understanding of the theory, one cannot analyze actual experimental data to obtain more basic and realistic physical quantities. In particular, if one intends to apply the theories in industry, accurate understanding and ability to modify the theory are essential. Your search for the perfect polymers textbook ends here - with *Polymer Science and Technology*. By incorporating an innovative approach and consolidating in one volume the fundamentals currently covered piecemeal in several books, this efficient text simplifies the learning of polymer science. The book is divided into three main sections: polymer fundamentals; polymer formation and conversion into useful articles; and polymer properties and applications. *Polymer Science and Technology* emphasizes the basic, qualitative understanding of the concepts rather than rote memorization or detailed mathematical analysis. Since the book focuses on the ultimate property of

the finished product, it minimizes laborious descriptions of experimental procedures used for the characterization of polymers. Instead, the author highlights how the various stages involved in the production of the finished product influence its properties. Well-organized, clear-cut, and user-friendly, Polymer Science and Technology is an outstanding textbook for teaching junior and senior level undergraduates and first year graduate students in an introductory course covering the challenging subject of polymers. 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. Extensively revised and updated to keep abreast of recent advances, Polymers: Chemistry and Physics of Modern Materials, Third Edition continues to provide a broad-based, high-information text at an introductory, reader-friendly level that illustrates the multidisciplinary nature of polymer science. Adding or amending roughly 50% of the material, Modern polymer materials are designed by applying principles of correlation between chemical structure, physical macrostructure and technological properties. Fundamentals of polymer physics are explained in this book without excessive use of calculations. Four main sections treat relaxation of polymers, melting and crystallization, the mechanism of deformation in thermoplastics, elastomers and multiphase systems, and thermodynamics of mixing and swelling of polymers and polymer networks. The book presents the theoretical models of polymer physics in a comprehensive style and relates their applicability to real polymer systems in terms of the available experimental observations. Successful characterization of polymer systems is one of the most important objectives of today's experimental research of polymers. Considering the tremendous scientific, technological, and economic importance of polymeric materials, not only for today's applications but for the industry of the 21st century, it is impossible to overestimate the usefulness of experimental techniques in this field. Since the chemical, pharmaceutical, medical, and agricultural industries, as well as many others, depend on this progress to an enormous degree, it is critical to be as efficient, precise, and cost-effective in our empirical understanding of the performance of polymer systems as possible. This presupposes our proficiency with, and understanding of, the most widely used experimental methods and techniques. This book is designed to fulfill the requirements of scientists and engineers who wish to be able to carry out experimental research in polymers using modern methods. Each chapter describes the principle of the respective method, as well as the detailed procedures of experiments with examples of actual applications. Thus, readers will be able to apply the concepts as described in the book to their own experiments. Addresses the most important practical techniques for experimental research in the growing field of polymer science The first well-documented presentation of the experimental methods in one consolidated source Covers principles, practical techniques, and actual examples Can be used as a handbook or lab manual for both students and researchers Presents ideas and methods from an international perspective Techniques addressed in this volume include: Light Scattering Neutron Scattering and X-Ray Scattering Fluorescence Spectroscopy NMR on Polymers Rheology Gel Experiments The book provides a systematic and profound account of scientific challenges in fuel cell research. The introductory chapters bring readers up to date on the urgency and implications of the global energy challenge, the prospects of electrochemical energy conversion technologies, and the thermodynamic and electrochemical

principles underlying the operation of polymer electrolyte fuel cells. The book then presents the scientific challenges in fuel cell research as a systematic account of distinct components, length scales, physicochemical processes, and scientific disciplines. The main part of the book focuses on theory and modeling. Theoretical tools and approaches, applied to fuel cell research, are presented in a self-contained manner. Chapters are arranged by different fuel cell materials and components, and sections advance through the hierarchy of scales, starting from molecular-level processes in proton-conducting media or electrocatalytic systems and ending with performance issues at the device level, including electrochemical performance, water management, durability, and analysis of failure mechanisms. Throughout, the book gives numerous examples of formidable scientific challenges as well as of tools to facilitate materials design and development of diagnostic methods. It reveals reserves for performance improvements and uncovers misapprehensions in scientific understanding that have misled or may continue to mislead technological development. An indispensable resource for scientifically minded and practically oriented researchers, this book helps industry leaders to appreciate the contributions of fundamental research, and leaders of fundamental research to appreciate the needs of industry. New polymeric substances and materials with new, often unusual properties arise frequently. This volume presents a problem in determining the physical properties of polymers and thus makes it difficult to tackle the question of the synthesis of polymers with desired properties. The author has approached this problem in a semi-empirical manner, which like van Krevelen's empirical method is based on the principle of increment and deriving calculations from it, but in Askadskii's approach each equation for the calculation of properties is physically based, and its parameters are connected with characteristics of atoms (Van-der-Waals volume, dispersive interaction) which compose the reoccurring unit of polymer, as well as with characteristics of energy of intermolecular interaction. Particular attention is paid to the relaxation of properties of polymers, which determine the mechanical serviceability of materials. Publisher Description The 3rd edition of this important dictionary offers more than 12,000 entries with expanded encyclopaedic-style definitions making this major reference work invaluable to practitioners, researchers and students working in the area of polymer science and technology. This new edition now includes entries on computer simulation and modeling, surface and interfacial properties and their characterization, functional and smart polymers. New and controlled architectures of polymers, especially dendrimers and controlled radical polymerization are also covered. Understanding of polymer interactions is important for effective processing of plastics and their blends, mixing with nanoparticles, and understanding of their mechanical and physical (e.g., electrical) properties. This book describes a new physics of interactions in polymers that challenges existing theories, and explains the concept of entanglement in a very different way. Rheology is formulated with different parameters defining the physics of dual-phase and cross-dual-phase. The rubbery behavior of thermoplastics is explained quite differently to conventional theory. Rheo-fluidification experiments which are applicable to industry (injection molding, extrusion, sheet forming, etc.) are described and analyzed, including molding under conditions of reduced viscosity (up to several hundred percent). The application of this theory to industry has already been proven by a number of successful derived inventions. 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. *Polymer Science and Innovative Applications: Materials, Techniques, and Future Developments* introduces the science of innovative polymers and composites, their analysis via experimental techniques and simulation, and their utilization in a variety of application areas. This approach helps to unlock the potential of new materials for product design and other uses. The book also examines the role that these applications play in the human world, from pollution and health impacts, to their potential to make a positive contribution in areas including environmental remediation, medicine and healthcare, and renewable energy. Advantages, disadvantages, possibilities, and challenges relating to the utilization of polymers in human society are included. Presents the latest advanced applications of polymers and their composites and identifies key areas for future development. Introduces the simulation methods and experimental techniques involved in the modification of polymer properties, supported by clear and detailed images and diagrams. Supports an interdisciplinary approach, enabling readers across different fields to harness the power of new materials for innovative applications. The contents have been divided into sections on physical states of polymers and characterization techniques. Chapters on physical states include discussions of the rubber elastic state, the glassy state, melts and concentrated solutions, the crystalline state, and the mesomorphic state. Characterization techniques described are molecular spectroscopy and scattering techniques. This comprehensive textbook describes the synthesis, characterization and technical and engineering applications of polymers. Offering a broad and balanced introduction to the basic concepts of macromolecular chemistry and to the synthesis and physical chemistry of polymers, it is the ideal text for graduate students and advanced Masters students starting out in polymer science. Building on the basic principles of organic chemistry and thermodynamics, it provides an easily understandable and highly accessible introduction to the topic. Step by step, readers will obtain a detailed and well-founded understanding of this vibrant and increasingly important subject area at the intersection between chemistry, physics, engineering and the life sciences. Following an approach different from many other textbooks in the field, the authors, with their varying backgrounds (both from academia and industry), offer a new perspective. Starting with a clear and didactic introduction, the book discusses basic terms and sizes and shapes of polymers and macromolecules. There then follow chapters dedicated to polymers in solutions, molar mass determination, and polymers in the solid state, incl. (partially) crystalline or amorphous polymers as well as their application as engineering materials. Based on this information, the authors explain the most important polymerization methods and techniques. Often neglected in other textbooks, there are chapters on technical polymers, functional polymers, elastomers and liquid crystalline polymers, as well as polymers and the environment. An overview of current trends serves to generate further interest in present and future developments in the field. This book is the English translation of the successful German textbook "Polymere", which was awarded the Chemical Industry in Germany's 2015 literature Prize ("Literaturpreis des Fonds der Chemischen Industrie") for its innovative, novel approach, and its good accessibility and readability, while at the same time providing comprehensive coverage of the field of polymer science. This book provides an important structural analysis of polymer solutions and melts, using fractal analysis. The book covers the theoretical fundamentals of macromolecules fractal analysis. It then goes on to discuss the fractal physics of polymer solutions and the fractal physics of melts. The intended audience of the book includes specialists in chemistry and physics of polymer synthesis and those in the field of polymers and polymer composites processing. *Polymer Physics* provides an introduction to the field for upper level undergraduates and first year graduate students. Any student with a working knowledge of calculus, physics and chemistry should be able to read this book. The essential tools of the polymer physical chemist or engineer are derived in this book without skipping any steps. A polymer is a very large molecule consisting of many atoms covalently bonded like a chain. Polymers take a random coil conformation in solution and entangle each other when the polymer concentration is high. The unique structure gives unique physical properties to polymer solutions. This book is an introduction to the modern theory of polymer physics. It describes basic concepts and methods to discuss the statistical properties of the assembly of chain-like molecules. This involves scaling theory, concentration fluctuation, gels and reptation. 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. Fundamentals of Polymer Science for Engineers Filling a gap in the market, this textbook provides a concise, yet thorough introduction to polymer science for advanced engineering students and practitioners, focusing on the chemical, physical and materials science aspects that are most relevant for engineering applications. After covering polymer synthesis and properties, the major section of the book is devoted to polymeric materials, such as thermoplastics and polymer composites, polymer processing such as injection molding and extrusion, and methods for large-scale polymer characterization. The text concludes with an overview of engineering plastics. The emphasis throughout is on application-relevant topics, and the author focuses on real-life, industry-relevant polymeric materials. A revised edition of a classic text Polymers are macromolecules built up by linking large numbers of smaller molecules. Due to their diverse physical properties, polymers have become central to a number of important industries, including plastics, rubber, adhesives, fiber, and paint industries. Introduction to Physical Polymer Science, Third Edition is the definitive reference for polymer researchers. Emphasizing interrelationships between molecular structure and the morphology and mechanical behavior of polymers, the Third Edition incorporates new findings in processing and characterizing polymers. Many new worked examples and study problems have been added. The new material includes: New chapters devoted to polymer surfaces and polymer blends Discussions on solid-state nuclear magnetic resonance methods, self-assembled polymers, scaling law basics, polymer processing, hyperbranched dendrimers, and the kinetics of polymerization Current research interests, such as polyolefins, thermoset plastics, pyroelectric and piezoelectric polymers, supercritical fluids, biomedical applications, film formation, and natural polymers Introduction to Physical Polymer Science, Third Edition continues to be the ideal resource for students and professional chemists, chemical engineers, materials scientists, and polymer scientists. | An insightful exploration of cutting-edge spectroscopic techniques in polymer characterization In Spectroscopic Techniques for Polymer Characterization: Methods, Instrumentation, Applications, a team of distinguished chemists delivers a comprehensive exploration of the vast potential of spectroscopic characterization techniques in polymer research. The book offers a concise outline of the principles, advantages, instrumentation, experimental techniques, and noteworthy applications of cutting-edge spectroscopy. Covering a wide range of polymers, from nylon to complex polymeric nanocomposites, the author presents recent developments in polymer science to polymer, analytical, and material chemists, assisting them in keeping track of the progress in modern spectroscopy. Spectroscopic Techniques for Polymer Characterization contains contributions from pioneers in modern spectroscopic techniques from around the world. The included materials bridge the gap between spectroscopists, polymer scientists, and engineers in academia and industry. The book also offers: A thorough introduction to the progress in spectroscopic techniques, including polymer spectroscopy and near-infrared spectroscopy Comprehensive explorations of topical polymers studied by spectroscopy, including polymer thin films, fluoropolymers, polymer solutions, conductive polymers Practical discussions of infrared imaging, near-infrared imaging, two-dimensional correlation spectroscopy, and far-ultraviolet spectroscopy In-depth examinations of spectroscopic studies of weak hydrogen bonding in polymers Spectroscopic Techniques for Polymer Characterization: Methods, Instrumentation, Applications is a must-read reference for polymer, analytical, and physical chemists, as well as materials scientists and spectroscopists seeking a one-stop resource for polymer characterization using spectroscopic analyses. Poly mer Interface and Adhesion provides the critical basis for further advancement in thisfield. Combining the principles of interfacial science, rheology, stress analysis, and fracturemechanics, the book teaches a new approach to the analysis of long standing problemsuch as: how is the interface formed; what are its physical and mechanical properties;and how does the interface modify the stress field and fracture strength of the material.The book offers many outstanding features, including extensive listings of pertinent references,exhaustive tabulations of the interfacial properties of polymers, critical reviews ofthe many conflicting theories, and complete discussions of coupling agents, adhesion promotion,and surface modifications. Emphasis is placed on physical concepts and mechanisms,using clear, understandable mathematics.Polymer Interface and Adhesion promotes a more thorough understanding of the physical,mechanical, and adhesive properties of multiphase,

polymer systems. Polymer scientists and engineers, surface chemists, materials scientists, rheologists, as well as chemical and mechanical engineers interested in the research, development or industrial applications of polymers, plastics, fibers, coatings, adhesives, and composites need this important new source book. How can a scientist or engineer synthesize and utilize polymers to solve our daily problems? This introductory text, aimed at the advanced undergraduate or graduate student, provides future scientists and engineers with the fundamental knowledge of polymer design and synthesis to achieve specific properties required in everyday applications. In the first five chapters, this book discusses the properties and characterization of polymers, since designing a polymer initially requires us to understand the effects of chemical structure on physical and chemical characteristics. Six further chapters discuss the principles of polymerization reactions including step, radical chain, ionic chain, chain copolymerization, coordination and ring opening. Finally, material is also included on how commonly known polymers are synthesized in a laboratory and a factory. This book is suitable for a one semester course in polymer chemistry and does not demand prior knowledge of polymer science. This successor to the popular textbook, "Polymer Physics" (Springer, 1999), is the result of a quarter-century of teaching experience as well as critical comments from specialists in the various sub-fields, resulting in better explanations and more complete coverage of key topics. With a new chapter on polymer synthesis, the perspective has been broadened significantly to encompass polymer science rather than "just" polymer physics. Polysaccharides and proteins are included in essentially all chapters, while polyelectrolytes are new to the second edition. Cheap computing power has greatly expanded the role of simulation and modeling in the past two decades, which is reflected in many of the chapters. Additional problems and carefully prepared graphics aid in understanding. Two principles are key to the textbook's appeal: 1) Students learn that, independent of the origin of the polymer, synthetic or native, the same general laws apply, and 2) students should benefit from the book without an extensive knowledge of mathematics. Taking the reader from the basics to an advanced level of understanding, the text meets the needs of a wide range of students in chemistry, physics, materials science, biotechnology, and civil engineering, and is suitable for both masters- and doctoral-level students. Praise for the previous edition: ...an excellent book, well written, authoritative, clear and concise, and copiously illustrated with appropriate line drawings, graphs and tables. - Polymer International ...an extremely useful book. It is a pleasure to recommend it to physical chemists and materials scientists, as well as physicists interested in the properties of polymeric materials. - Polymer News This valuable book is ideal for those who wish to get a brief background in polymer science as well as for those who seek a further grounding in the subject. - Colloid Polymer Science The solutions to the exercises are given in the final chapter, making it a well thought-out teaching text. - Polymer Science Exploring the chemistry of synthesis, mechanisms of polymerization, reaction engineering of step-growth and chain-growth polymerization, polymer characterization, thermodynamics and structural, mechanical, thermal and transport behavior of polymers as melts, solutions and solids, Fundamentals of Polymer Engineering, Third Edition covers essential concepts and breakthroughs in reactor design and polymer production and processing. It contains modern theories and real-world examples for a clear understanding of polymer function and development. This fully updated edition addresses new materials, applications, processing techniques, and interpretations of data in the field of polymer science. It discusses the conversion of biomass and coal to plastics and fuels, the use of porous polymers and membranes for water purification, and the use of polymeric membranes in fuel cells. Recent developments are brought to light in detail, and there are new sections on the improvement of barrier properties of polymers, constitutive equations for polymer melts, additive manufacturing and polymer recycling. This textbook is aimed at senior undergraduate students and first year graduate students in polymer engineering and science courses, as well as professional engineers, scientists, and chemists. Examples and problems are included at the end of each chapter for concept reinforcement. The physical properties of a polymer are strongly dependent on the size or length of the polymer chain. As chain length is increased, melting and boiling temperatures increase quickly. Impact resistance also tends to increase with chain length, as does the viscosity, or resistance to flow, of the polymer in its melted state. In this book, the authors present topical research in the study of the structure, physical properties and industrial uses of polymer chains. Topics discussed include the flexibility of polyheteroarylenes and the effect on several physical properties of these polymers; aliphatic polyester-based nanocomposites; bioplastic-based blends; interactions in small permeants in polymeric matrices; the role of polymer chain ends in plasma surface modification

and pre-ceramic polymer chains.

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