Polymer Physics Rubinstein

This first book on this important and emerging topic presents an overview of the very latest results obtained in single-chain polymer nanoparticles obtained by folding synthetic single polymer chains, painting a complete picture from synthesis via characterization to everyday applications. The initial chapters describe the synthetics methods as well as the molecular simulation of these nanoparticles, while subsequent chapters discuss the analytical techniques that are applied to characterize them, including size and structural characterization as well as scattering techniques. The final chapters are then devoted to the practical applications in nanomedicine, sensing, catalysis and several other uses, concluding with a look at the future for such nanoparticles. Essential reading for polymer and materials scientists, materials engineers, biochemists as well as environmental chemists.

"Provides a physical interpretation of the data obtained in macromolecular transport phenomena in a given system and also addresses some important issues and concepts related to biopolymers such as proteins and nucleic acids"--

Groundbreaking monograph by Nobel Prize winner for researchers and graduate students covers Liouville equation, anharmonic solids, Brownian motion, weakly coupled gases, scattering theory and short-range forces, general kinetic equations, more. 1962 edition.

A molecular view on the fundamental issues in polymer physics is provided with an aim at students in chemistry, chemical engineering, condensed matter physics and material science courses. An updated translation by the

author, a renowned Chinese chemist, it has been proven to be an effective source of learning for many years. Up-to-date developments are reflected throughout the work in this concise presentation of the topic. The author aims at presenting the subject in an efficient manner, which makes this particularly suitable for teaching polymer physics in settings where time is limited, without having to sacrifice the extensive scope that this topic demands.

Non-Equilibrium Statistical Mechanics

Nuclear Organization and Function

Branched Polymers II

Principles of Polymerization

Scaling Concepts in Polymer Physics

The Structure and Rheology of Complex Fluids describes the microstructures of polymeric, colloidal, amphiphilic, and liquid crystalline liquids, and the relationship between microstructure and mechanical and flow properties. It provides illustrations, practical examples, and worked problems. This book can serve as both a textbook for a graduate course and a research monograph.

Four-part treatment covers principles of quantum statistical mechanics, systems composed of independent molecules or other independent subsystems, and systems of interacting molecules, concluding with a consideration of quantum statistics.

This text presents an introduction to the field of statistical physics of macromolecules, from the basic concepts to modern achievements. Applications in various fields of polymer physical chemistry and molecular biophysics are also covered, as are: the fundamentals of statistical theory of polymer solutions and melts; classical, sealing

and renormalization group approaches; the main ideas of statistical theories of polymer liquid crystals, polymer networks and polyelectrolytes; dynamic viscoelastic behavior of polymer systems; models of house, Zimm and reptation concepts; and specific features of main biopolymers - DNA and proteins. This English edition also includes sections describing the most important recent advances such as: statistical theory of DNA gel-electrophoresis, polymers at interfaces, and dynamics of concentrated solutions of rigid polymers.

Synthetic Lubricants and High-Performance Functional Fluids, Second Edition offers state-of-the-art information on all the major synthetic fluids, describing established products as well as highly promising experimental fluids with commercial potential. This second edition contains chapters on polyinternalolefins, polymer esters, refrigeration lube

Soft Condensed Matter

A Conceptual Introduction

Here, There, and Everywhere

Soft Matter Physics

Fundamentals of Polymer Engineering, Third Edition

The present text is an outgrowth of such a laboratory course given by the author at the University of Rochester between 1959 and 1963. It consisted of a one-year course with two 3-hour meetings in the laboratory and two 1-hour lecture meetings weekly; the students had access to the laboratory at all times and, in general, worked during hours of their own choice well in excess of the scheduled periods. The students worked in pairs, which in most cases provides a highly

motivating and successful relationship.The material included in this course was selected from those experiments in atomic and nuclear physics that have laid the foundation and provided the evidence for modern quantum theory. The experiments were set up in such a fashion that they could be completed in a two- to four-week period of normal work taking into account the other demands on the studentâ€™s time.

From the Introduction PVT data consists of records of the specific volume of a material (or its inverse, the density) as a function of pressure and temperature. There are many reasons why the specific volume of a material will undergo changes: changes in the temperature and pressure (thermal expansion and compression), phase changes (solid-solid phase transitions, melting, crystallization, glass transitions, mesophase transitions), degradation reactions, and many more. Conversely, PVT measurements can be used to study these phenomena and also to yield derivative data of direct importance to engineering applications of materials (compressibility, bulk modulus, thermal expansivity, etc.). PVT methods are part of a wide array of thermoanalytical techniques available to scientists and engineers, but PVT is the only commonly practiced technique that includes pressure as a variable. Polymers are sensitive to pressure: the volume itself, the pressure dependence of transition temperatures, and the kinetics of phase transitions are all significant, not only from a scientific point of view, but also for practical applications in polymer engineering, such as processing. Now published. This unique polymer reference

book will be useful to all those involved in polymer research and advanced engineering. The more than 350 tables and graphs provide a wealth of important data in easy-to-use form. The introductory chapter provides details on methodology, equipment use, and information on the many ways in which PVT data can be used in research and engineering.

Polymer physics is one of the key courses not only in polymer science but also in material science. In his textbook Strobl presents the elements of polymer physics to the necessary extent in a very didactical way. His main focus is on the concepts and major phenomena of polymer physics, not just on mere physical methods. He has written the book in a personal style evaluating the concepts he is dealing with. Every student in polymer and materials science will be happy to have it on his shelf.

With contributions by numerous experts

Standard Pressure Volume Temperature Data for Polymers

Concepts for Understanding Their Structures and Behavior

Topics In Polymer Physics

Polymer Physics

An Introduction to Statistical Thermodynamics

Colloidal systems are important across a range of industries, such as the food, pharmaceutical, agrochemical, cosmetics, polymer, paint and oil industries, and form the basis of a wide range of products (eg cosmetics & toiletries, processed foodstuffs and photographic film). A detailed understanding of their formation, control and application is required in those industries, yet many new graduate or postgraduate chemists or chemical engineers have little or no direct experience of colloids. Based on lectures given at the highly

successful Bristol Colloid Centre Spring School, Colloid Science: Principles, Methods and Applications provides a thorough introduction to colloid science for industrial chemists, technologists and engineers. Lectures are collated and presented in a coherent and logical text on practical colloid science.

A well-rounded and articulate examination of polymer properties at the molecular level, Polymer Chemistry focuses on fundamental principles based on underlying chemical structures, polymer synthesis, characterization, and properties. It emphasizes the logical progression of concepts and provide mathematical tools as needed as well as fully derived problems for advanced calculations. The much-anticipated Third Edition expands and reorganizes material to better develop polymer chemistry concepts and update the remaining chapters. New examples and problems are also featured throughout. This revised edition: Integrates concepts from physics, biology, materials science, chemical engineering, and statistics as needed. Contains mathematical tools and step-by-step derivations for example problems. Incorporates new theories and experiments using the latest tools and instrumentation and topics that appear prominently in current polymer science journals. Polymer Chemistry, Third Edition offers a logical presentation of topics that can be scaled to meet the needs of introductory as well as more advanced courses in chemistry, materials science, polymer science, and chemical engineering.

?? Giant molecules are important in our everyday life. But, as pointed out by the authors, they are also associated with a culture. What Bach did with the harpsichord, Kuhn and Flory did with polymers. We owe a lot of thanks to those who now make this music accessible ??Pierre-Gilles de GennesNobel Prize laureate in Physics(Foreword for the 1st Edition, March 1996)This book describes the basic facts, concepts and ideas of polymer physics in simple, yet scientifically accurate, terms. In both scientific and historic contexts, the book shows how the subject of polymers is fascinating, as it is behind most of the wonders of living cell

machinery as well as most of the newly developed materials. No mathematics is used in the book beyond modest high school algebra and a bit of freshman calculus, yet very sophisticated concepts are introduced and explained, ranging from scaling and reptations to protein folding and evolution. The new edition includes an extended section on polymer preparation methods, discusses knots formed by molecular filaments, and presents new and updated materials on such contemporary topics as single molecule experiments with DNA or polymer properties of proteins and their roles in biological evolution.

Soft matter (polymers, colloids, surfactants, liquid crystals) are an important class of materials for modern and future technologies. They are complex materials that behave neither like a fluid nor a solid. This book describes the characteristics of such materials and how we can understand such characteristics in the language of physics.

Statistical Physics of Macromolecules

Introduction to Physical Polymer Science

Polymer Chemistry, Second Edition

Colloid Science

Synthesis, Characterization, Simulations, and Applications

Providing a comprehensive review of the state-of-the-art advanced research in the field, Polymer Physics explores the interrelationships among polymer structure, morphology, and physical and mechanical behavior. Featuring contributions from renowned experts, the book covers the basics of important areas in polymer physics while projecting into the future, making it a valuable resource for students and chemists, chemical engineers, materials scientists, and polymer scientists as well as professionals in related industries.

Analysis, modeling, and simulation for better

understanding of diverse complex natural and social phenomena often require powerful tools and analytical methods. Tractable approaches, however, can be developed with mathematics beyond the common toolbox. This book presents the white noise stochastic calculus, originated by T Hida, as a novel and powerful tool in investigating physical and social systems. The calculus, when combined with Feynman's summation-over-all-histories, has opened new avenues for resolving cross-disciplinary problems. Applications to real-world complex phenomena are further enhanced by parametrizing non-Markovian evolution of a system with various types of memory functions. This book presents general methods and applications to problems encountered in complex systems, scaling in industry, neuroscience, polymer physics, biophysics, time series analysis, relativistic and nonrelativistic quantum systems.

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.

“Highly recommended!” – CHOICE New Edition Offers Improved Framework for Understanding Polymers Written by well-established professors in the field, Polymer Chemistry, Second Edition provides a well-rounded and articulate examination of polymer properties at the molecular level. It focuses on fundamental principles based on underlying chemical structures, polymer synthesis, characterization, and properties. Consistent with the previous edition, the authors emphasize the logical progression of concepts, rather than presenting just a catalog of facts. The book covers topics that appear prominently in current polymer science journals. It also provides mathematical tools as

needed, and fully derived problems for advanced calculations. This new edition integrates new theories and experiments made possible by advances in instrumentation. It adds new chapters on controlled polymerization and chain conformations while expanding and updating material on topics such as catalysis and synthesis, viscoelasticity, rubber elasticity, glass transition, crystallization, solution properties, thermodynamics, and light scattering. Polymer Chemistry, Second Edition offers a logical presentation of topics that can be scaled to meet the needs of introductory as well as more advanced courses in chemistry, materials science, and chemical engineering.

Understanding Rheology

Fundamentals of Polymer Physics and Molecular Biophysics

Methods And Applications Of White Noise Analysis In Interdisciplinary Sciences

The Physics of Polymers

Principles of Polymer Chemistry

An Updated Edition of the Classic Text Polymers constitute the basis for the plastics, rubber, adhesives, fiber, and coating industries. The Fourth Edition of Introduction to Physical Polymer Science acknowledges the industrial success of polymers and the advancements made in the field while continuing to deliver the comprehensive

*introduction to polymer science that made its predecessors classic texts. The Fourth Edition continues its coverage of amorphous and crystalline materials, glass transitions, rubber elasticity, and mechanical behavior, and offers updated discussions of polymer blends, composites, and interfaces, as well as such basics as molecular weight determination. Thus, interrelationships among molecular structure, morphology, and mechanical behavior of polymers continue to provide much of the value of the book. Newly introduced topics include: * Nanocomposites, including carbon nanotubes and exfoliated montmorillonite clays * The structure, motions, and functions of DNA and proteins, as well as the interfaces of polymeric biomaterials with living organisms * The glass transition behavior of nano-thin plastic films In addition, new sections have been included on fire retardancy, friction and wear, optical tweezers, and more. Introduction to Physical Polymer Science, Fourth Edition provides both an essential introduction to the field*

as well as an entry point to the latest research and developments in polymer science and engineering, making it an indispensable text for chemistry, chemical engineering, materials science and engineering, and polymer science and engineering students and professionals.

Problems at the end of each chapter provide the reader with the opportunity to apply what has been learned to practice."--Jaquette du livre.

The 75th CSH Symposium volume reviews the latest advances in research into nuclear structure, the organization of the genome within the nucleus, and spatiotemporal coordination of nuclear processes.

This text offers an introduction to the properties and behaviour of soft matter. It begins with a treatment of the underlying principles, then discusses how the properties of certain substances and systems are treated within this framework.

Encyclopedia of Complexity and Systems Science

Giant Molecules

Single-Chain Polymer Nanoparticles

Polymer Chemistry
Microgravity Polymers

Over the past twenty years our understanding of polymer solutions has undergone a dramatic evolution. New methods and concepts have extended the frontier of the theory from dilute solutions in which polymers move independently of each other, to concentrated solutions where many polymersentangle with each other. This book provides a comprehensive account of the modern theory for the dynamical properties of polymer solutions. This includes viscoelasticity, diffusion, dynamic light scattering and flow and electric birefringence. Nonlinear viscoelasticity is discussed in detail on thebasis of molecular dynamical models. The book fills a gap between classical theory and modern developments and constructs a consistent picture for the dynamics of polymer solutions over the entire concentration range.

This book can serve as an introduction to students interested in learning the techniques used in developing mathematical models of physical phenomenon in polymers; or it can furnish the background information to the experienced professional desiring to broaden his/her knowledge of polymers. The senior author presented material in this book to students interested in learning the fundamental mathematics underlying many areas of polymer physics and in lectures to audiences with varying backgrounds in polymer physics. Too many times, the basic equations are presented in final form from either lack of space or the assumption that the derivation is widely disseminated and does not require repetition. A wide variety of topics are covered, from the statistical physics and thermodynamics of polymers, to the optical and electrical behavior of polymers, as well as spectroscopy techniques for polymers.A website for the book is available at the URL:

web.mac.com/rsstein1/iWebThis contains pages describing the book, the authors, information about important polymer scientists, links to additional material, book corrections, and recent developments./a

Nuclear Architecture and Dynamics provides a definitive resource for (bio)physicists and molecular and cellular biologists whose research involves an understanding of the organization of the genome and the mechanisms of its proper reading, maintenance, and replication by the cell. This book brings together the biochemical and physical characteristics of genome organization, providing a relevant framework in which to interpret the control of gene expression and cell differentiation. It includes work from a group of international experts, including biologists, physicists, mathematicians, and bioinformaticians who have come together for a comprehensive presentation of the current developments in the nuclear dynamics and architecture field. The book provides the uninitiated with an entry point to a highly dynamic, but complex issue, and the expert with an opportunity to have a fresh look at the viewpoints advocated by researchers from different disciplines. Highlights the link between the (bio)chemistry and the (bio)physics of chromatin Deciphers the complex interplay between numerous biochemical factors at task in the nucleus and the physical state of chromatin Provides a collective view of the field by a large, diverse group of authors with both physics and biology backgrounds

This volume of Macromolecular Symposia contains lectures presented at the 15th Polymer Networks Group Meeting held in Crackow, Poland in July, 2000. Polymer networks are now recognized as a distinct and valuable field of study. This view is reflected in the high level of interest shown by participants at the meeting. In addition to theoretical findings, the topics covered by this volume include interpenetrating

networks---their formation, structure and properties---and heterogeneous, filled and hybrid networks. Research into the properties of hydrophilic and hydrophobic gels is also presented, as are studies of thermoset formation and the structure of sulfur.

Physical Chemistry of Polymers

Introduction to Polymer Physics

Polymer Networks

A Molecular Approach

Simulation Methods for Polymers

This encyclopedia provides an authoritative single source for understanding and applying the concepts of complexity theory together with the tools and measures for analyzing complex systems in all fields of science and engineering. It links fundamental concepts of mathematics and computational sciences to applications in the physical sciences, engineering, biomedicine, economics and the social sciences.

Polymer Physics provides and 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.

The first stage of the physics of long, flexible chains was pioneered by eminent scientists such as Debye, Kuhn, Kramers, and Flory, who formulated the basic ideas. In recent years, because of the availability of new experimental and theoretical tools, a second stage of the physics of polymers has evolved. In this book, a noted physicist explains the radical changes that have taken place in this exciting and rapidly developing field. Pierre-Gilles de Gennes points out

the three developments that have been essential for recent advances in the study of large-scale conformations and motions of flexible polymers in solutions and melts. They are the advent of neutron-scattering experiments on selectively deuterated molecules; the availability of inelastic scattering of laser light, which allows us to study the cooperative motions of the chains; and the discovery of an important relationship between polymer statistics and critical phenomena, leading to many simple scaling laws. Until now, information relating to these advances has not been readily accessible to physical chemists and polymer scientists because of the difficulties in the new theoretical language that has come into use. Professor de Gennes bridges this gap by presenting scaling concepts in terms that will be understandable to students in chemistry and engineering as well as in physics.

This book introduces the concepts of physical chemistry of polymers. It provides a basis to bridge polymer chemistry, which targets microscopic chain structures, and polymer engineering, which targets macroscopic material properties and functions. Topics covered are single chain statistics, multi-chain interactions, and chain dynamics, both from a viewpoint of structure, properties (mostly mechanical ones), and their interrelation. In all that, the author encourages the reader to think conceptually.

From Suspensions to Nanocomposites and Beyond

Statistical Mechanics of Chain Molecules

Properties of Polymers

The Structure and Rheology of Complex Fluids

The Theory of Polymer Dynamics

Properties of Polymers: Their Correlation with Chemical Structure; Their Numerical Estimation and Prediction from Additive Group Contributions summarizes the latest developments regarding polymers, their properties in relation to chemical structure, and methods for estimating and predicting numerical properties from chemical structure. In particular, it examines polymer electrical properties, magnetic properties, and mechanical properties, as well as their crystallization and environmental behavior and failure. The rheological properties of polymer melts and polymer solutions are also considered. Organized into seven parts encompassing 27 chapters, this book begins with an overview of polymer science and engineering, including the typology of polymers and their properties. It then turns to a discussion of thermophysical properties, from transition temperatures to volumetric and calorimetric properties, along with the cohesive aspects and conformation statistics. It also introduces the reader to the behavior of polymers in electromagnetic and mechanical fields of force. The book covers the quantities that influence the transport of heat, momentum, and matter, particularly heat conductivity, viscosity, and diffusivity; properties that control the chemical stability and breakdown of polymers; and polymer properties as an integral concept, with emphasis on processing and product properties. Readers will find tables that give valuable (numerical) data on polymers and include a survey of the group contributions (increments) of almost every additive function considered. This book is a valuable resource for anyone working on practical problems in the field of polymers, including organic chemists, chemical engineers, polymer processers, polymer technologists, and both graduate and PhD students.

The new edition of a classic text and reference The large chains of molecules known as polymers are currently used in

everything from "wash and wear" clothing to rubber tires to protective enamels and paints. Yet the practical applications of polymers are only increasing; innovations in polymer chemistry constantly bring both improved and entirely new uses for polymers onto the technological playing field. Principles of Polymerization, Fourth Edition presents the classic text on polymer synthesis, fully updated to reflect today's state of the art. New and expanded coverage in the Fourth Edition includes: * Metallocene and post-metallocene polymerization catalysts * Living polymerizations (radical, cationic, anionic) * Dendrimer, hyperbranched, brush, and other polymer architectures and assemblies * Graft and block copolymers * High-temperature polymers * Inorganic and organometallic polymers * Conducting polymers * Ring-opening polymer ization * In vivo and in vitro polymerization Appropriate for both novice and advanced students as well as professionals, this comprehensive yet accessible resource enables the reader to achieve an advanced, up-to-date understanding of polymer synthesis. Different methods of polymerization, reaction parameters for synthesis, molecular weight, branching and crosslinking, and the chemical and physical structure of polymers all receive ample coverage. A thorough discussion at the elementary level prefaces each topic, with a more advanced treatment following. Yet the language throughout remains straightforward and geared towards the student. Extensively updated, Principles of Polymerization, Fourth Edition provides an excellent textbook for today's students of polymer chemistry, chemical engineering, and materials science, as well as a current reference for the researcher or other practitioner working in these areas.

This book is a concise textbook on polymer physics for graduate students. Researchers in physics, physical chemistry and chemical engineers who are interested in

complex fluids can also benefit from the book.
Rheology--the study of the deformation and flow of matter--deals primarily with the stresses generated during the flow of complex materials including polymers, colloids, foams, and gels. A rapidly growing and industrially important field, it plays a significant role in polymer processing, food processing, coating and printing, and many other manufacturing processes. Designed as a main text for advanced undergraduate- or graduate-level courses in rheology or polymer rheology, Understanding Rheology is also an ideal self-teaching guide for practicing engineers and scientists who find rheological principles applicable to their work. Covering the most important aspects of elementary modern rheology, this detailed and accessible text opens with an introduction to the field and then provides extensive background chapters on vector and tensor operations and Newtonian fluid mechanics. It continues with coverage of such topics as: * Standard Flows for Rheology * Material Functions * Experimental Observations * Generalized Newtonian Fluids * Generalized Linear-Viscoelastic Fluids * Nonlinear Constitutive Equations * Rheometry, including rheo-optics Understanding Rheology incorporates helpful pedagogical aids including numerous problems for each chapter, many worked examples, and an extensive glossary. It also contains useful appendices on nomenclature, mathematical tools, predictions of constitutive equations, and birefringence.
Experiments in Modern Physics
Principles, Methods and Applications
Nuclear Architecture and Dynamics