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The Mesoscopic Theory Of Polymer Dynamics Springer Series In Chemical Physics

BRYNN WOODARD

The Mesoscopic Theory of Polymer Dynamics
Oxford University Press on Demand
This book, now in its third edition, explores how human populations grow, based on their creative abilities. To reconsider the theory of economic growth from a physicist's perspective, the book analyses the concepts of value and utility and their relationship to thermodynamic concepts. This approach allows the author to include characteristics of technology in descriptions of development and to formulate a phenomenological (macroeconomic, no-price fluctuations are discussed) theory of production as a set of evolutionary equations in one-sector and multi-sector approximations. The theory is proved to be useful for describing both national economies and global production in ancient times. This monograph presents the topics in a compact and consistent manner and can be used by students with a background in physics and other natural sciences who wish to specialize in

economics. It explains how the growth of production is connected with advances in technology, consumption of labour and energy and makes it possible to analyse past and present social production systems and to build scripts of future progress. The book is of interest to energy specialists engaged in planning and analyzing the production and consumption of energy carriers, and to economists wanting to know how energy and technology affect economic growth. This third edition has been substantially revised and three brand new chapters have been added. Chapter 8 illustrates the robustness of the theory with the aid of statistical historical data from the Russian economy, while Chapter 12 is devoted to a reconstruction of the global production activity in ancient times. Chapter 13 discusses the principles of the organization of social production.

Polymers and Neutron Scattering

CRC Press

Handbook of Numerical Methods for Hyperbolic Problems explores the changes that have taken place in the past few decades regarding literature in the design, analysis and application of various numerical algorithms for solving hyperbolic equations. This volume provides concise summaries from experts in different types of algorithms, so that readers can find a

variety of algorithms under different situations and readily understand their relative advantages and limitations.

The Equilibrium Theory of Inhomogeneous Polymers Springer

This book provides a comprehensive account of the modern theory for the dynamical properties of polymer solutions. The theory has undergone dramatic evolution over the last two decades due to the introduction of new methods and concepts that have extended the frontier of theory from dilute solutions in which polymers move independently to concentrated solutions where many polymers converge. Among the properties examined are viscoelasticity, diffusion, dynamic light scattering, and electric birefringence. Nonlinear viscoelasticity is discussed in detail on the basis of molecular dynamical models. The book bridges the gap between classical theory and new developments, creating a consistent picture of polymer solution dynamics over the entire concentration range.

Polymer Analysis/Polymer Theory Imperial College Press

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 *The Theory of Polymer Dynamics* CRC Press This multi-volume handbook is the most up-to-date and comprehensive reference work in the field of fractional calculus and its numerous applications. This fourth volume collects authoritative chapters covering several applications of fractional calculus in physics, including classical and continuum mechanics. **The Mesoscopic Theory of Polymer Dynamics** Springer may never overcome the effects of hysteresis and stress (see Chapters 6 and 12). The first sentence of the reference work, Handbook of Liquid Crystals, reads: The terms liquid crystals, crystalline liquid, mesophase, and mesomorphous state are used synonymously to describe a state of aggregation that exhibits a molecular order in a size range similar to that of a crystal but acts more or less as a viscous liquid: [2] In other words, molecules within a liquid crystalline phase possess some orientational order and lack positional order; furthermore, the shape of a liquid crystalline sample is determined by the vessel in which it is contained rather than by the orientational order of its aggregated molecules. The authors recognized the

limitations and imprecision of this definition but, like others preceding them, could not devise a simple and generally applicable one that is better. Regardless, the terms 'liquid crystal' and 'mesophase' should not be used interchangeably. As mentioned above, all liquid crystals are mesophases, but all mesophases are not liquid crystals. Recent studies, employing elaborate and sophisticated analytical techniques, have permitted finer distinctions between classical crystals and mesophases. At the same time, they have made definitions like that from the Handbook of Liquid Crystals somewhat obsolete for reasons other than terminology. One part of the problem arises from the use of a combination of bulk properties (like flow) and microscopic properties (like molecular ordering) within the same definition.

Modern Theory of Polymer Solutions

Elsevier

No-one who took part in the NATO Advanced Studies Institute from which this book emerges will have forgotten the experience. True, the necessary conditions for a very successful workshop were satisfied: a field of physics bursting with new power and new puzzles, a matchless team of lecturers, an international gathering of students many of whom had themselves contributed at the

forefront of their subject, an admirable overlap of experiment and theory, a good mix of experimenters and theorists, an enviable environment. But who could have foreseen the way the workshop became a focus for future directions, how fresh scientific ideas tumbled out of the discussion periods, how the context of teaching the field produced such fruitfulness of research at the highest level? The organisers did have some specific aims in mind. Perhaps foremost was the desire to compare notes among different areas within the sub field of soft condensed matter physics fast becoming known as "complex fluids". For readers seeking a definition, the prosaic "fluids with bits in" can be passed rapidly over in favour of the elegant discussion of slow variables by Scott Milner in his chapter. The uniting goals of the subject are to model the essential molecular or mesoscopic structure theoretically, and to probe this structure as well as the bulk response of the system experimentally. Our famous examples were: colloids, polymers, liquid crystals, block co-polymers and self-assembling surfactant systems.

Simulation Methods for Polymers Springer Science & Business Media

Biomaterials repair, reinforce or replace damaged functional parts of the (human) body. All mechanical and biological

interactions between an implant and the body occur across the interface, which has to correspond as nearly as possible to its particular function. Much of the progress in adapting polymer materials for use in a biological environment has been obtained through irradiation techniques. For this reason the most recent developments in four key areas are reviewed in this special volume: (1) the analysis of the topology and the elemental composition of a functional surface, (2) the chemical modification of the surface which results in highly pure, sterile and versatile surfaces, (3) the sterilisation of implantable devices via ionising radiation and its possible effects on the structural mechanical properties of polymers, and (4) the radiation effects on living cells and tissues which are of particular importance for radiation protection and radiotherapy.

Fuel Cells I Springer Science & Business Media

This book is a concise and clearly written introduction to the modern theory of polymer physics. The book describes basic concepts and methods of investigating the statistical properties of the assembly of chain-like molecules. The topics discussed include scaling theory, concentration fluctuation, gels, and reptation. Both graduate students and researchers in physics, physical chemistry, chemical engineering, and materials science

will find this an extremely useful textbook and reference work.

Introduction to Polymer Physics

World Scientific

The application of neutron scattering to polymers has been extremely successful during the last two decades. This book presents, for the first time, both the theories and experimental examples which are needed to understand how these techniques can be applied. Now available in paperback forthe first time this book is specifically written to introduce the newcomer and non-expert to the experimental techniques and the basic theory necessary to understand the results.

Mesoscopic Physics of Complex Materials CRC Press

A cross-disciplinary study of the physical properties of complex fluids, solids, and interfaces as a function of their mesoscopic structures, with empasis on nonequilibrium phenomena. The book introduces readers to the methods of non-equilibrium statistical mechanics as applied to complex materials, but always connects theories with experiments. It shows the underlying connections between topics as diverse as critical phenomena in colloidal dynamics, glassy state relaxation and deformation, reinforced polymer composites, molecular level mixing in nanocomposites, and rough surfaces and

interfaces. At the same time, each chapter is designed to be independent from the others so that the book can serve as a reference work as well as a text. It is not designed to review all the recent work in mesoscopic physics, which spans many disciplines, but rather attempts to establish a general framework for understanding and developing new materials that can not be designed by the trial and error methods. A familiarity with the basics of statistical mechanics and condensed matter physics is assumed. Viscoelasticity of Polymers Springer Science & Business Media
This book, based on lectures given at the Polytechnic of Milan, gives a broad overview of the field of polymer dynamics. In these lectures the aim is to stress the fundamental concepts of the behaviour of polymers without drawing on the more advanced mathematical formalism which often obscures the natural elegance of the subject matter. Professor De Gennes is one of the most distinguished workers in the field of material science. Therefore this book will be welcomed by both the experienced researcher in the area and the interested layman. It will be of particular value to graduate students. **Mechanical and Thermophysical Properties of Polymer Liquid Crystals** Cornell University Press

The progress in polymer science is revealed in the chapters of Polymer Science: A Comprehensive Reference, Ten Volume Set. In Volume 1, this is reflected in the improved understanding of the properties of polymers in solution, in bulk and in confined situations such as in thin films. Volume 2 addresses new characterization techniques, such as high resolution optical microscopy, scanning probe microscopy and other procedures for surface and interface characterization. Volume 3 presents the great progress achieved in precise synthetic polymerization techniques for vinyl monomers to control macromolecular architecture: the development of metallocene and post-metallocene catalysis for olefin polymerization, new ionic polymerization procedures, and atom transfer radical polymerization, nitroxide mediated polymerization, and reversible addition-fragmentation chain transfer systems as the most often used controlled/living radical polymerization methods. Volume 4 is devoted to kinetics, mechanisms and applications of ring opening polymerization of heterocyclic monomers and cycloolefins (ROMP), as well as to various less common polymerization techniques. Polycondensation and non-chain

polymerizations, including dendrimer synthesis and various "click" procedures, are covered in Volume 5. Volume 6 focuses on several aspects of controlled macromolecular architectures and soft nano-objects including hybrids and bioconjugates. Many of the achievements would have not been possible without new characterization techniques like AFM that allowed direct imaging of single molecules and nano-objects with a precision available only recently. An entirely new aspect in polymer science is based on the combination of bottom-up methods such as polymer synthesis and molecularly programmed self-assembly with top-down structuring such as lithography and surface templating, as presented in Volume 7. It encompasses polymer and nanoparticle assembly in bulk and under confined conditions or influenced by an external field, including thin films, inorganic-organic hybrids, or nanofibers. Volume 8 expands these concepts focusing on applications in advanced technologies, e.g. in electronic industry and centers on combination with top down approach and functional properties like conductivity. Another type of functionality that is of rapidly increasing importance in polymer science is introduced in volume 9. It deals with various aspects of

polymers in biology and medicine, including the response of living cells and tissue to the contact with biofunctional particles and surfaces. The last volume is devoted to the scope and potential provided by environmentally benign and green polymers, as well as energy-related polymers. They discuss new technologies needed for a sustainable economy in our world of limited resources. Provides broad and in-depth coverage of all aspects of polymer science from synthesis/polymerization, properties, and characterization methods and techniques to nanostructures, sustainability and energy, and biomedical uses of polymers Provides a definitive source for those entering or researching in this area by integrating the multidisciplinary aspects of the science into one unique, up-to-date reference work Electronic version has complete cross-referencing and multi-media components Volume editors are world experts in their field (including a Nobel Prize winner)

Fundamentals of Polymer Physics and Molecular Biophysics

Springer

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Numerical Methods for Non-Newtonian Fluids

Newnes

One of the most exciting areas of polymer research is the study of interfacial phenomena and their practical applications.

This major work reviews the key research in this important area and is used in such areas as biomaterials. Part one looks at the thermodynamics, kinetics and other fundamental properties of polymer surfaces and interfaces. The second part of the book reviews ways of characterising and manipulating interfacial phenomena. It includes examples of practical applications such as vaccine delivery, tissue engineering and the development of therapeutic lung surfactants. With its distinguished editor and international team of contributors, Molecular interfacial phenomena of polymers and biopolymers is a standard work on understanding polymeric interfacial properties and their medical and other practical applications. Reviews key research in this hot area including biomaterials Examines polymeric interfacial properties and reviews medical and other practical applications Edited by a leading authority with contributions from distinguished experts worldwide

The Mesoscopic Theory of Polymer Dynamics

Springer

This volume is a collection of lectures on the current topics in various areas of physics which were presented at the Inauguration Conference of Asia-Pacific Center for Theoretical Physics.

The Equilibrium Theory

of Inhomogeneous Polymers OUP Oxford S. Georgiou: Laser Cleaning Methodologies of Polymer Substrates; T. Lippert: Laser Application of Polymers; J. Krueger, W. Kautek: Ultrashort Pulse Laser Interactions with Polymers and Dielectrics; Y. Zhang: Synchrotron Radiation Direct Photo-Etching of Polymers.
Statistical Physics of Polymers John Wiley & Sons
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Topics in Polymer Physics World Scientific
Our brutal century of atom bombs and spaceships can also be called the century ofpolymers. In any case, the broad spreading ofsynthetic polymer materials is one of thesigns of our time. A look at the various aspects of our life is enough to convince us that polymeric materials (textiles, pl- tics, rubbers) are as widely spread and important in our life as are other materials (metals and non-metals) derived from small molecules. Polymers have entered the life of the twentieth century as irreplaceable construction materials. Polymers differ from other substances by the size of their molecules which, appropriately enough, are referred to as macromolecules, since they consist of thousands or tens of thousands of atoms (molecular weight up to -4 6 10 ormore) andhave a macroscopic rectilinear length (upto 10 cm). The atoms ofa

macromolecule are firmly held together by valence bonds, fo- ing a single entity. In polymeric substances, the weaker van der Waals forces have an effect on the components of the macromolecules which form the system. The structure of polymeric systems is more complicated than that oflow-molecular solids or liquids, but there are some common features: the atoms within a given macromolecule are ordered, but the centres ofmass of the individual macromolecules and parts of them are distributed randomly. Remarkably, the mechanical response of polymeric systems combines the elasticity of a solid with the fluidity of a liquid.

Polymers and Light

Springer Science & Business Media

Ideal for one- or two-semester courses that assume elementary knowledge of calculus, This text presents the fundamental concepts of thermodynamics and applies these to problems dealing with properties of materials, phase transformations, chemical reactions, solutions and surfaces. The author utilizes principles of statistical mechanics to illustrat