Dynamics Of Polymeric Liquids Volume 1 Fluid Mechanics

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Models for Polymeric and Anisotropic Liquids Springer Science & Business Media
Dynamics of Polymeric Liquids, Second Edition Volume 2: Kinetic Theory R. Byron Bird, Charles F. Curtiss, Robert C. Armstrong and Ole Hassager Volume Two deals with the molecular aspects of polymer rheology and fluid dynamics. It is the only book currently available dealing with kinetic theory and its relation to nonlinear rheological properties. Considerable emphasis is given to the connection between kinetic theory results and experimental data. The second edition contains new material on the basis for molecular modeling, the application of phase-space theory to dilute solutions, kinetic theory of melts and melt mixtures, and network theories. 1987 (0 471-80244-1) 450 pp.
Levico Terme, Italy 2016 Springer Science & Business Media
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.
The Structure and Rheology of Complex Fluids Garland Science
This volume of the Advances in Engineering Fluid Mechanics Series covers topics in hydrodynamics related to polymerization of elastomers and plastics. Emphasis is given to advanced concepts in multiphase reactor systems often used in the manufacturing of products. This volume is comprised of 30 chapters that address key subject areas such as multiphase mixing concepts, multicomponet reactors and the hydrodynamics associated with their operations, and slurry flow behavior associated with non-Newtonian flows.
Polymer Dynamics and Relaxation John Wiley & Sons
This book serves as an introduction to the continuum mechanics and mathematical modeling of complex fluids in living systems. The form and function of living systems are intimately tied to the nature of surrounding fluid environments, which commonly exhibit nonlinear and history dependent responses to forces and displacements. With ever-increasing capabilities in the visualization and manipulation of biological systems, research on the fundamental phenomena, models, measurements, and analysis of complex fluids has taken a number of exciting directions. In this book, many of the world's foremost experts explore key topics such as: Macro- and micro-rheological techniques for measuring the material properties of complex biofluids and the subtleties of data interpretation Experimental observations and rheology of complex biological materials, including mucus, cell membranes, the cytoskeleton, and blood The motility of microorganisms in complex fluids and the dynamics of active suspensions Challenges and solutions in the numerical simulation of biologically relevant complex fluid flows This volume will be accessible to advanced undergraduate and beginning graduate students in engineering, mathematics, biology, and the physical sciences, but will appeal to anyone interested in the intricate and beautiful nature of complex fluids in the context of living systems.
Elasticity and Fluid Dynamics: Volume 3 of Modern Classical Physics CRC Press
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.
Dynamics and Heat-Mass Transfer Wiley-Interscience
A groundbreaking textbook on twenty-first-century fluids and elastic solids and their applications Kip Thorne and Roger Blandford's monumental Modern Classical Physics is now available in five stand-alone volumes that make ideal textbooks for individual graduate or advanced undergraduate courses on statistical physics; optics; elasticity and fluid dynamics; plasma physics; and relativity and cosmology. Each volume teaches the fundamental concepts, emphasizes modern, real-world applications, and gives students a physical and intuitive understanding of the subject. Elasticity and Fluid Dynamics provides an essential introduction to these subjects. Fluids and elastic solids are everywhere—from Earth's crust and skyscrapers to ocean currents and airplanes. They are central to modern physics, astrophysics, the Earth sciences, biophysics, medicine, chemistry, engineering, and technology, and this centrality has intensified in recent years—so much so that a basic understanding of the behavior of elastic solids and fluids should be part of the repertoire of every physicist and engineer and almost every other natural scientist. While both elasticity and fluid dynamics involve continuum physics and use similar mathematical tools and modes of reasoning, each subject can be readily understood without the other, and the book allows them to be taught independently, with the first two chapters introducing and covering elasticity and the last six doing the same for fluid dynamics. The book also can serve as supplementary reading for many other courses, including in astrophysics, geophysics, and aerodynamics. Includes many exercise problems Features color figures, suggestions for further reading, extensive cross-references, and a detailed index Optional "Track 2" sections make this an ideal book for a one-quarter or one-semester course in elasticity, fluid dynamics, or continuum physics An online illustration package is available to professors The five volumes, which are available individually as paperbacks and ebooks, are Statistical Physics; Optics; Elasticity and Fluid Dynamics; Plasma Physics; and Relativity and Cosmology.
Rheological Measurement Wiley-Interscience
This book provides readers with the most current, accurate, and practical fluid mechanics related applications that the practicing BS level engineer needs today in the chemical and related industries, in addition to a fundamental understanding of these applications based upon sound fundamental basic scientific principles. The emphasis remains on problem solving, and the new edition includes many more examples.
Introductory Transport Phenomena Elsevier
This book consists of two strongly interweaved parts: the mathematical theory of stochastic processes and its applications to molecular theories of polymeric fluids. The comprehensive mathematical background provided in the first section will be equally useful in many other branches of engineering and the natural sciences. The second part provides readers with a more direct understanding of polymer dynamics, allowing them to identify exactly solvable models more easily, and to develop efficient computer simulation algorithms in a straightforward manner. In view of the examples and applications to problems taken from the front line of science, this volume may be used both as a basic textbook or as a reference book. Program examples written in FORTRAN are available via ftp from ftp.springer.de/pub/chemistry/polysim/.
Principles of Polymer Processing John Wiley & Sons
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.
Dynamics of Polymeric Liquids, Volume 2 Princeton University Press
The first four volumes of the series on 'Charged and Reactive Polymers' have been devoted to polymers in solution (Voh. I and II) or in gel and membrane forms (Vols. III and IV). In correlation with charges, other physical or chemical properties of macro molecules have been considered.

Understanding of charge and hydrophobic effects is equally important for synthetic and biopolymers or their systems. Optically Active Polymers are related to problems of the same class, since optical activity is an inherent property of both natural macromolecules as well as a great variety of polymers synthesized in the Jast twenty years. Optical activity is a physical spectral property of chiral matter caused by asymmetrical configurations, conformations and structures which have no plane and no center of symmetry and consequently have two mirror image enantiomeric forms of inverse optical rotation. The racemic mixture of chiral enantiomers is optically inactive. The most common form of optical activity was first measured at a constant wavelength by the angle of rotation of linearly polarized light. More recently the measurements have been extended to the entire range of visible and attainable ultraviolet regions where electronic transitions are observed, giving rise to the ORD technique (Optical Rotatory Dispersion). The Cotton effects appear in the region of optically active absorption bands; outside of these bands the plain curve spectrum is also dependent on all the electronic transitions of the chromophores.

Introduction to Polymer Physics OUP Oxford

Introductory Transport Phenomena by R. Byron Bird, Warren E. Stewart, Edwin N. Lightfoot, and Daniel Klingenberg is a new introductory textbook based on the classic Bird, Stewart, Lightfoot text, Transport Phenomena. The authors’ goal in writing this book reflects topics covered in an undergraduate course. Some of the rigorous topics suitable for the advanced students have been retained. The text covers topics such as: the transport of momentum; the transport of energy and the transport of chemical species. The organization of the material is similar to Bird/Stewart/Lightfoot, but presentation has been thoughtfully revised specifically for undergraduate students encountering these concepts for the first time. Devoting more space to mathematical derivations and providing fuller explanations of mathematical developments—including a section of the appendix devoted to mathematical topics—allows students to comprehend transport phenomena concepts at an undergraduate level.

Polymer Rheology Cambridge University Press

Volume 1 presents first fundamental principles of the rheology of polymeric fluid including kinematics and stresses of a deformable body, the continuum theory for the viscoelasticity of flexible homogeneous polymeric liquids, the molecular theory for the viscoelasticity of flexible homogeneous polymeric liquids, and the experimental methods for the measurement of the rheological properties of poylmeric liquids. The materials presented are intended to set a stage for the subsequent chapters by introducing the basic concepts and principles of rheology, from both phenomenological and molecular perspectives, ofstructurally simple flexible and homogeneous polymeric liquids. Next, this volume presents the rheological behavior of structurally complex polymeric materials including miscible polymer blends, block copolymers, liquid-crystalline polymers, thermoplastic polyurethanes, immiscible polymer blends, perticulare-filled polymers, organoclay nanocomposites, molten polymers with dissolved gas, and thermosts.

Thermodynamics of Polymer Blends, Volume I BoD – Books on Demand

In many cases rheological measurements are carried out in the simplest of geometries, but the interpretation involved in obtaining the rheological parameters of the test fluids from these measurements is surprisingly complex. The purpose of this book is to emphasise the points on which most workers in the field agree, and to let the authors deal with the contentious points according to their own beliefs and experience. This work represents a summary of the current thought on rheological meas urement by experts in the various techniques. When making measurements and obtaining from them parameters that describe the flow behaviour of the test fluids, it is essential that the experimentalist understands the underlying theory and shortcomings of the measurement technique, that he is aware of the likely microstructure of the fluid, and that from this he can appreciate how the fluid and the measuring system will interact with each other. It is this interaction that gives both the required rheological parameters of the fluids and the artefacts that confuse the issue. This book covers the main rheological measurement techniques from capillary, slit and stretching flows to rotational and oscillatory rheometry in various geometries including sliding plate measurements. These topics are backed up by chapters on more practical aspects, such as commercial instruments, and on computer control and data acquisition. The chapters deal with the basic methods, how the measurements are taken, and what assumptions and interpretations are made to obtain valid data on the test fluids.

Polymer Physics Cambridge University Press

Polymers exhibit a range of physical characteristics, from rubber-like elasticity to the glassy state. These particular properties are controlled at the molecular level by the mobility of the structural constituents. Remarkable changes in mobility can be witnessed with temperature, over narrow, well defined regions, termed relaxation processes. This is an important, unique phenomenon controlling polymer transition behaviour and is described here at an introductory level. The important types of relaxation processes from amorphous to crystalline polymers and polymeric miscible blends are covered, in conjunction with the broad spectrum of experimental methods used to study them. In-depth discussion of molecular level interpretation, including atomistic level computer simulations and applications to molecular mechanism elucidation, are discussed. The result is a self-contained approach to polymeric interpretation suitable for researchers in materials science, physics and chemistry interested in the relaxation processes of polymeric systems.

From Suspensions to Nanocomposites and Beyond John Wiley & Sons

This two-volume work is detailed enough to serve as a text and comprehensive enough to stand as a reference. Volume 1, Fluid Mechanics, summarizes the key experiments that show how polymeric fluids differ from structurally simple fluids, then presents, in rough historical order, various methods for solving polymer fluid dynamics problems. Volume 2, Kinetic Theory, uses molecular models and the methods of statistical mechanics to obtain relations between bulk flow behavior and polymer structure. Includes end-of-chapter problems and extensive appendixes.

Dynamics of Polymeric Liquids: Bird, R. B., Armstrong, R. C., Hassager, O. Fluid mechanics Wiley-Interscience

From the Authors' Preface The advancements of technology . . . and chemical engineering have brought about extensive use of a wide range of rheologically complex materials, e.g., polymeric solutions and melts, suspensions, mixtures, oil products, fibre-forming substances, etc. that are characterized by diverse and, every so often, significant deviations from classical Newtonian behavior. Such materials are often used in conditions where the formation of vapor-gas bubbles or two-phase flow regimes is possible. This necessitates deep investigations into the thermo-hydrodynamic problems of liquids with bubbles for the case of a continuous phase with anomalous rheological properties. These conditions are typical of a number of applications and manufacturing processes, e.g., gas removal from polymeric solutions or melts in production of film, chemical fibres and other polymeric materials. . . . The bubbles containing gas or vapor-gas mixtures are often present in polymeric systems. This is because of a number of reasons, e.g., a low wettability of solid surfaces by polymers, the use of volatile solvents, abundance of vapor-gas nuclei, the capture of gas by porous or fibre-like polymeric particles during the polymer dissolution or melting, etc. Spontaneous evacuation of bubbles in polymeric media is usually complicated by a high viscosity of the liquid; therefore two-phase polymeric systems possess a higher sedimentation and aggregation stability than bubble mixtures in low-molecular-weight liquids. One of the main problems in the dynamics of vapor-liquid and gas-liquid systems is the investigation of heat and mass transfer and phase interactions in a liquid with bubbles. The decisive importance of this problem in the analysis of various aspects of the bubbly fluid behavior under diverse conditions, in particular, during a sound wave propagation, has given impetus to numerous researches. The current state of art in the investigation of Newtonian liquids with bubbles is described in voluminous literature. However, these problems have been much less studied for non-Newtonian systems. Behavior of bubbles in polymeric liquids is of great interest because of wide application in chemical technology. . . . In a number of processes connected with the application of polymeric fluids, the dynamic interaction of bubbles with liquid phase plays the key role. Such interaction in the case of a polymeric liquid phase are essentially influenced by the specific properties of macromolecular fluids, including primarily the rheological effects. These effects in the bubble dynamics combined with heat and mass transfer between the bubble content and the ambient liquid constitute the main subject of the analysis presented in this book. Macrokinetics Laboratory, and Full Professor at the Byelorussian Polytechnic Institute, Department of Heat and Power Engineering. Dr. Schulman is recognized as a leading authority in his field of investigation. Extensive Bibliography: A valuable feature of this new book is its extensive international bibliography, with 393 references.

Dynamics of Polymeric Liquids, 2 Volume Set Garland Pub

This book offers a comprehensive introduction to polymer rheology with a focus on the viscoelastic characterization of polymeric materials. It contains various numerical algorithms for the processing of viscoelastic data, from basic principles to advanced examples which are hard to find in the existing literature. The book takes a multidisciplinary approach to the study of the viscoelasticity of polymers, and is self-contained, including the essential mathematics, continuum mechanics, polymer science and statistical mechanics needed to understand the theories of polymer viscoelasticity. It covers recent achievements in polymer rheology, such as theoretical and experimental aspects of large amplitude oscillatory shear (LAOS), and numerical methods for linear viscoelasticity, as well as new insights into the interpretation of experimental data. Although the book is balanced between the theoretical and experimental aspects of polymer rheology, the author’s particular interest in the theoretical side will not remain hidden. Aimed at readers familiar with the mathematics and physics of engineering at an undergraduate level, the multidisciplinary approach employed enables researchers with various scientific backgrounds to expand their knowledge of polymer rheology in a systematic way.

CRC Press

This two-volume work is detailed enough to serve as a text and comprehensive enough to stand as a reference. Volume 1, Fluid Mechanics, summarizes the key experiments that show how polymeric fluids differ from structurally simple fluids, then presents, in rough historical order, various methods for solving polymer fluid dynamics problems. Volume 2, Kinetic Theory, uses molecular models and the methods of statistical mechanics to obtain relations between bulk flow behavior and polymer structure. Includes end-of-chapter problems and extensive appendixes.

Polymer Physics Pitman Publishing

This book presents a series of challenging mathematical problems which arise in the modeling of Non-Newtonian fluid dynamics. It focuses in particular on the mathematical and physical modeling of a variety of contemporary problems, and provides some results. The flow properties of Non-Newtonian fluids differ in many ways from those of Newtonian fluids. Many biological fluids (blood, for instance) exhibit a non-Newtonian behavior, as do many naturally occurring or technologically relevant fluids such as molten polymers, oil, mud, lava, salt solutions, paint, and so on. The term "complex flows" usually refers to those fluids presenting an "internal structure" (fluid mixtures, solutions, multiphase flows, and so on). Modern research on complex flows has increased considerably in recent years due to the many biological and industrial applications.

A Physical Introduction to Suspension Dynamics Elsevier

Non-Newtonian (non-linear) fluids are common in nature, for example, in mud and honey, but also in many chemical, biological, food, pharmaceutical, and personal care processing industries. This Special Issue of Fluids is dedicated to the recent advances in the mathematical and physical modeling of non-linear fluids with industrial applications, especially those concerned with CFD studies. These fluids include traditional non-Newtonian fluid models, electro- or magneto-rheological fluids, granular materials, slurries, drilling fluids, polymers, blood and other biofluids, mixtures of fluids and particles, etc.