

Introduction To Polymer Rheology

Modern day high-performance computers are making available to 21st-century scientists solutions to rheological flow problems of ever-increasing complexity. Computational rheology is a fast-moving subject ¶ problems which only 10 years ago were intractable, such as 3D transient flows of polymeric liquids, non-isothermal non-Newtonian flows or flows of highly elastic liquids through complex geometries, are now being tackled owing to the availability of parallel computers, adaptive methods and advances in constitutive modelling.Computational Rheology traces the development of numerical methods for non-Newtonian flows from the late 1960's to the present day. It begins with broad coverage of non-Newtonian fluids, including their mathematical modelling and analysis, before specific computational techniques are discussed. The application of these techniques to some important rheological flow problems of academic and industrial interest is then treated in a detailed and up-to-date exposition. Finally, the reader is kept abreast of topics at the cutting edge of research in computational applied mathematics, such as adaptivity and stochastic partial differential equations.All the topics in this book are dealt with from an elementary level and this makes the text suitable for advanced undergraduate and graduate students, as well as experienced researchers from both the academic and industrial communities.

Rheology is applied extensively in polymer, chemical, food processing, and related industries. This book combines the basic concepts and applications by presenting a balanced overview of the principles. With simplified analysis of complex problems, the textbook format provides easy understanding for both students and practicing professionals. There is no competing book with such a wide scope, including unique topics such as diffusion, flows about particles, and liquid mixing. This second edition is abundantly updated throughout. Highlights include elongational flow measurements, POM-POM modeling, diffusion and rheology of polymer nanocomposites, new results based on CFD simulations, and much more.

An analysis of polymer and composite rheology. This second edition covers flow properties of thermoplastic and thermoset polymers, and general principles and applications of all phases of polymer rheology, with new chapters on the rheology of particulate and fibre composites. It also includes new and expanded detail on polymer blends and emulsions, foams, reacting systems, and flow through porous media as well as composite processing operations.

This book is the first to introduce a mesoscale polymer simulation system called OCTA. With its name derived from "Open Computational Tool for Advanced material technology," OCTA is a unique software product, available without charge, that was developed in a project funded by Japanese government. OCTA contains a series of simulation programs focused on mesoscale simulation of the soft matter COGNAC, SUSHI, PASTA, NAPLES, MUFFIN, and KAPSEL. When mesoscale polymer simulation is performed, one may encounter many difficulties that this book will help to overcome. The book not only introduces the theoretical background and functions of each simulation engine, it also provides many examples of the practical applications of the OCTA system. Those examples include predicting mechanical properties of plastic and rubber, morphology formation of polymer blends and composites, the micelle structure of surfactants, and optical properties of polymer films. This volume is strongly recommended as a valuable resource for both academic and industrial researchers who work in polymer simulation.

Polymer and Composite Rheology

Polymer Melt Rheology

Computational Rheology

The Theory of Polymer Dynamics

Rheology

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

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.

"Rheology in Polymer Processing" introduces the fundamentals of rheology and rheometry as the basis for modeling and computer-aided design in plastics processing. The logically structured content enables the reader to intelligently use the tools of computer-aided design and modeling of plastics processing, with correct interpretation of the results. The book presents difficult and complex issues of rheology and modeling in an accessible way, with particular emphasis on the practical engineering aspects. The software described in the book allows modeling all the important problems of plastics processing. Particular attention is paid to the extrusion process, which is fundamentally important as a processing technology in mass manufacture of plastic parts, and the basis of compounding processes (blending, filling, granulation, and reinforcement). This book is aimed equally at engineers, researchers, and scientists, as well as intermediate students, for whom it will serve as an ideal course book.

An Introduction to Polymer Rheology and Processing is a practical desk reference providing an overview of operating principles, data interpretation, and qualitative explanation of the importance and relationship of rheology to polymer processing operations. It covers full-scale processing operations, relating industrial processing operations and design methodology to laboratory-scale testing. Hundreds of design formulas applicable to scaling up the processing behavior of polymeric melts are presented. The book also provides a "working knowledge" description of major rheological test methods useful in product development and includes a useful glossary of polymer and test method/instrumentation definitions. Lavishly illustrated and featuring numerous sample calculations and modeling approaches, An Introduction to Polymer Rheology and Processing is a "must have" book for polymer engineers and rheologists.

Theory, Modelling and Applications

Computer Simulation of Polymeric Materials

Science and Technology of Rubber

Rheology for Chemists

Introduction to Physical Polymer Science

Polymer Rheology is a fundamental discipline underlying modern polymer processing. The term rheology could be generally defined as the science of deformation and flow for non-traditional materials that display a nonlinear combination of viscous, elastic and plastic effects, such as polymers, food stuffs, lubricating greases etc. The rheology of polymeric liquids is the most complicated part of general rheology. As any scientific discipline it consists of coupled theoretical and experimental parts. The most difficult part for the first studies of polymer rheology is the theory. This textbook attempts to overcome this difficulty and provide the readers with a balanced knowledge of modern types of continuum theories, experiments and some applications.

This Book Covers Wide Range Of Topics In The Polymer Rheology. These Include -The Basic Principles, Parameters, Systems And Applied Mathematical Models Used In The Rheological Studies. The Melt Flow Analysis Of Different Non-Newtonian Fluids In Laminar Flow, Transition Between Laminar And Turbulent Flow And Modified Reynolds Etc. The Effects Of Different Physical And Molecular Parameters On Purely Viscous Rheological Response Of Polymer Melts And Solutions. Principles Of Rheometry And Different Types Viscometers And On-Line Rheometers. The Static And Dynamic Viscoelastic Response Of The Polymer Melts And Solutions, Linear Viscoelasticity. Mechanical Models And Boltzmann Superposition Principle. Molecular Structure - Viscoelasticity Relationship And Linear And Non-Linear Viscoelasticity. A Good Number Of Solved Examples And Exercise Problems.The Book Will Be Of Immense Help To Both Under Graduate And Post-Graduate Students, Teachers, Polymer Engineers And Practicing Rheologists. Content Highlights : - # Preface # Introduction # Rheological Principles # Melt Flow Analysis # Parameters Influencing The Polymer Rheology # Rheometry # Viscoelastic Behaviour # Viscoelastic Functions : Effect Of Various Parameters # Rheology In Polymer And Rubber Processing # References

This text introduces the subject of rheology in terms understandable to non-experts and describes the application of rheological principles to many industrial products and processes.

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An Introduction to Polymer Rheology and Processing

Handbook of Polymer Synthesis, Characterization, and Processing

Modeling and Simulation

Rheology of Filled Polymer Systems

Rheology for Polymer Melt Processing

Rheology is the science that studies the behavior of the flow of matter in a liquid state or soft solids under the application of stress or deformation to obtain a response to an applied force. In polymers, rheology is an important tool to understand behavior under processing conditions and to design equipment. Another application for rheology in the polymer field is to understand structure-property relationships by means of molecular weight, molecular weight distribution, stereochemistry, morphology, melt degradation, and performance under processing. This book covers the essential criteria for selecting the best test types for various applications and new developments, for accurately interpreting results, and for determining other areas where rheology and rheological phenomena may be useful in your work.

Polymeric materials have been replacing other conventional materials like metals, glass and wood in a number of applications. The use of various types of fillers incorporated into the polymer has become quite common as a means of reducing cost and to impart certain desirable mechanieal, thermal, electrieal and magnetic properties to the polymers. Oue to the energy crisis and high priees of petrochemieals, there has been a greater demand to use more and more fillers to cheapen the polymeric materials while maintaining and/or improving their properties. The advantages that filled polymer systems have to offer are normally offset to some extent by the increased complexity in the rheological behavior that is introduced by the inclusion of the fillers. Usually when the use of fillers is considered, a compromise has to be made between the improved mechanical properties in the solid state, the increased difficulty in melt processing, the problem of achieving uniform dispersion of the filler in the polymer matrix and the economics of the process due to the added step of compounding. It has been recognized that addition of filler to the polymer brings a change in processing behavior. The presence of the filler increases the melt viscosity leading to increases in the pressure drop across the die but gives rise to less die swell due to decreased melt elasticity.

There are few comprehensive books on the market on the subject of rheology – the complex science dealing with flow and deformation of matter – and these are several years old. At last there is now a book that explains the meaning of a science that many scientists need to use but only a few can fully grasp. It does so by striking the balance between oversimplification and overload of theory in a very compelling and readable manner. The author's systematic presentation enables the authors to include all components of rheology in one volume. The first four chapters of this book discuss various aspects of theoretical rheology and, by examples of many studies, show how particular theory, model, or equation can be used in solving different problems. The main emphasis is on liquids, but solid materials are discussed in one full chapter as well. Methods of measurement and raw data treatment are included in one large chapter which constitutes more than one quarter of the book. Eight groups of methods are discussed giving many choices for experimentation and guidance on where and how to use them properly. The final chapter shows how to use rheological methods in different groups of products and methods of their manufacture. Usefulness of chemorheological (rheokinetical) measurements is also emphasized. This chapter continues with examples of purposeful applications in practical matters.

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.

Rheology of Polymer Blends and Nanocomposites

Principles and Applications

Understanding Rheology

Rheological and Morphological Properties of Dispersed Polymeric Materials

Butterworths Series in Chemical Engineering

"Providing new students and practitioners with an easy-to-understand introduction to the theory and practice an often complicated subject, Introduction to Polymer Rheology incorporates worked problems and problems with appended answers to provide opportunities for review and further learning of more advanced concepts. By limiting the use of mathematics within an approachable format, this introductory overview ensures practicing scientists and engineers understand the concepts underlying the flow behavior of polymer melts, solutions, and suspensions, and are able to interpret experimental data correctly and provide additional insight on a process"--

The rheology of polymer melts plays an important role today in industry and academia. Although several textbooks on this subject are available, with very few exceptions they cover homogeneous products only. This book is unique in that it focuses on heterogeneous systems such as particle-filled materials and polymer blends, which are highly important in the world market. It deals with similarities and differences of the flow properties of these two classes of material, providing both a fundamental and a practical understanding. Key points of the book are the viscous and elastic properties of engineering polymers filled with functional particles and the influence of nanoparticles on rheological properties. Two key aspects of rheological measurements are discussed: the influence of heterogeneous structures on the flow of materials important for processing and the use of rheological means to get an insight into morphological features. Both approaches are applied to particle-filled melts and to polymer blends. In the latter case it is shown in detail in which way the deformation of droplets formed by the dispersed phase can be affected by outer deformation, particularly in elongation.

Presented in an accessible and introductory manner, this is the first book devoted to the comprehensive study of colloidal suspensions.

"Rheology is an integral part of life, from decorative paint and movement of volcanic lava to the flow of blood in our veins. This book describes, without the use of complex mathematics, how atoms and molecules interact to control the handling properties of materials ranging from simple ionic crystals through polymers to colloidal dispersions. Beginning with an introduction to essential terminology, Rheology for Chemists goes on to discuss limiting behaviour, temporal behaviour and non-linear behaviour. Throughout, examples of everyday experiments are provided to illustrate the theory, which increases in complexity with each discrete chapter. Ideas are developed in a systematic fashion so that the mechanisms responsible for the elastic, viscous or viscoelastic behaviour of systems are understood. The text thus progresses in a manner that makes it an ideal introduction to rheology for any scientist who needs to use the ideas to modify systems. Comprehensive and unique in approach, this book will provide the necessary introduction to rheology for many undergraduates and graduates, as well as being valuable for laboratory and industrial staff requiring an introduction to this fascinating subject."

Understanding Viscoelasticity

Introduction to Polymer Rheology

From Structure to Flow Behavior and Back Again

Applied Rheology In Polymer Processing

An Introduction to Rheology

This book explores the ways in which melt flow behaviour can be exploited by the plastics engineer and technician for increased efficiency of processing operation, control of end product properties and selection and development of polymers for specific purposes. (reissued with minor corrections 1994)

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.

Rheology unites the seemingly unrelated fields of plasticity and non-Newtonian fluids by recognizing that both these types of materials are unable to support a shear stress in static equilibrium. In this sense, a plastic solid is a fluid. Granular rheology refers to the continuum mechanical description of granular materials. In this book, rheology--the study of the deformation and flow of matter--is treated primarily in the context of the stresses generated during the flow of complex materials such as 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.

The aim of the School on Rheology of Complex fluids is to bring together young researchers and teachers from educational and R&D institutions, and expose them to the basic concepts and research techniques used in the study of rheological behavior of complex fluids. The lectures will be delivered by well-recognized experts. The book contents will be based on the lecture notes of the school.

Filled Polymers and Polymer Blends

Applications of the OCTA System

An Introduction

Rheology of Polymeric Systems

Concepts, Methods & Applications

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 the basis 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.

Covering a broad range of polymer science topics, Handbook of Polymer Synthesis, Characterization, and Processing provides polymer industry professionals and researchers in polymer science and technology with a single, comprehensive handbook summarizing all aspects involved in the polymer production chain. The handbook focuses on industrially important polymers, analytical techniques, and formulation methods, with chapters covering step-growth, radical, and co-polymerization, crosslinking and grafting, reaction engineering, advanced technology applications, including conjugated, dendritic, and nanomaterial polymers and emulsions, and characterization methods, including spectroscopy, light scattering, and microscopy.

A revised molecular approach to a classic on viscoelastic behavior Because viscoelasticity affects the properties, appearance, processing, and performance of polymers such as rubber, plastic, and adhesives, a proper utilization of such polymers requires a clear understanding of viscoelastic behavior. Now in its third edition, Introduction to Polymer Viscoelasticity remains a classic in the literature of molecular viscoelasticity, bridging the gap between primers on polymer science and advanced research-level monographs. Assuming a molecular, rather than a mechanical approach, the text provides a strong grounding in the fundamental concepts, detailed derivations, and particular attention to assumptions, simplifications, and limitations. This Third Edition has been entirely revised and updated to reflect recent developments in the field. New chapters include: * Phenomenological Treatment of Viscoelasticity * Viscoelastic Models * Time-Temperature Correspondence * Transitions and Relaxation in Polymers * Elasticity of Rubbery Networks * Dielectric and NMR Methods With detailed explanations, corresponding equations, and experimental methods, supported by real-life applications (as well as the inclusion of a CD-ROM with data to support the exercises), this Third Edition provides today's students and professionals with the tools they need to create polymers with more desirable qualities than ever. The present monograph is intended as an introduction into a field which certainly did not receive proper attention in the past. It is one of the aims of this book to verify this supposition. The author hopes to show that the technique of the measurement of flow birefringence can fulfill an important complementary task in polymer melt rheology. From this point it is expected that the present monograph will attract the attention of polymer scientists in general, and of rheologists and process engineers in particular. Certainly, the fourth chapter will appeal to the latter group. As a teacher in polymer science and technology the author wants to address also the group of the graduate students. In fact, the standard knowledge acquired during usual university studies in chemistry, physics or engineering does not enable a quick start of research activities in the field of polymer melt rheology. Certainly, in this typically interdisciplinary field everyone can lay emphasis on matters which are familiar to him because of his preceding education. Significant research activities, however, can only be generated on the basis of a more universal knowledge. In the absence of this knowledge beginners have to rely upon the guidance of their supervisors for an unduly long period. Otherwise they take the risk of losing too much of their costly time. This holds in particular for the experimentalists who cannot be dispensed from being familiar with the necessary theoretical background.

Polymer Melt Rheology and Flow Birefringence

Fundamentals and Applications

Melt Rheology and Its Role in Plastics Processing

High Pressure Rheology for Quantitative Elasto-hydrodynamics

Constitutive Equations for Polymer Melts and Solutions

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.

The 3rd edition of The Science and Technology of Rubber provides a broad survey of elastomers with special emphasis on materials with a rubber-like elasticity. As in the 2nd edition, the emphasis remains on a unified treatment of the material; exploring topics from the chemical aspects such as elastomer synthesis and curing, through recent theoretical developments and characterization of equilibrium and dynamic properties, to the final applications of rubber, including tire engineering and manufacturing. Many advances have been made in polymer and elastomers research over the past ten years since the 2nd edition was published. Updated material stresses the continuous relationship between the ongoing research in synthesis, physics, structure and mechanics of rubber technology and industrial applications. Special attention is paid to recent advances in rubber-like elasticity theory and new processing techniques for elastomers. This new edition is comprised of 20% new material, including a new chapter on environmental issues and tire recycling. · Explores new applications of rubber within the tire industry, from new filler materials to “green tires (a tire that has yet to undergo curing and vulcanization). · 30% of the material has been revised from the previous edition with the addition of 20% new material, including a chapter on the environment. · A mixture of theory, experiments, and practical procedures will offer value to students, practitioners, and research & development departments in industry.

Recent advances in polymer science have made it possible to relate quantitatively molecular structure to rheological behavior. At the same time, new methods of synthesis and characterization allow the preparation and structural verification of samples having a range of branched polymeric structures. This book unites this knowledge to enable production of polymers with prescribed processability and end-product properties. Methods of polymer synthesis and characterization are described, starting from fundamentals. The foundations of linear viscoelasticity are introduced, and then the linear behavior of entangled polymers is described in detail. This is followed by a discussion of the molecular modeling of linear behavior. Tube models for both linear and branched polymers are presented. The final two chapters deal with nonlinear rheological behavior and tube models to describe nonlinearity. In this second edition, each chapter has been significantly rewritten to account for recent advances in experimental methods and theoretical modeling. It includes new and updated material on developments in polymer synthesis and characterization, computational algorithms for linear and nonlinear rheology prediction, measurement of nonlinear viscoelasticity, entanglement detection algorithms in molecular dynamics, nonlinear constitutive equations, and instabilities. Contents: - Structure of Polymers - Polymerization Reactions and Processes - Linear Viscoelasticity - Fundamentals - Linear Viscoelasticity - Behavior of Molten Polymers - Tube Models for Linear Polymers - Fundamentals - Tube Models for Linear Polymers - Advanced Topics - Determination of Molecular Weight Distribution Using Rheology - Tube Models for Branched Polymers - Nonlinear Viscoelasticity - Tube Models for Nonlinear Viscoelasticity of Linear and Branched Polymers

Constitutive Equations for Polymer Melts and Solutions presents a description of important constitutive equations for stress and birefringence in polymer melts, as well as in dilute and concentrated solutions of flexible and rigid polymers, and in liquid crystalline materials. The book serves as an introduction and guide to constitutive equations, and to molecular and phenomenological theories of polymer motion and flow. The chapters in the text discuss topics on the flow phenomena commonly associated with viscoelasticity; fundamental elementary models for understanding the rheology of melts, solutions of flexible polymers, and advanced constitutive equations; melts and concentrated solutions of flexible polymer; and the rheological properties of real liquid crystal polymers. Chemical engineers and physicists will find the text very useful.

Colloidal Suspension Rheology

Theory and Numerical Algorithms

Introduction to Polymer Physics

Introduction to Polymer Chemistry, Fourth Edition

The Structure and Rheology of Complex Fluids

This book presents the main results obtained by different laboratories involved in the research group Rheology for polymer melt processing which is associated with French universities, schools of engineering, and the CNRS (Centre National de la Recherche Scientifique - France). The group comprises some 15 research laboratories of varied disciplines (chemistry, physics, material sciences, mechanics, mathematics), but with a common challenge viz. to enhance the understanding of the relationships between macromolecular species, their rheology and their processing. Some crucial issues of polymer science have been addressed: correlation of viscoelastic macroscopic bulk property measurements and models, slip at the wall, extrusion defects, correlation between numerical flow simulations and experiments. Features of the book: • The book is unique in that it allows one to grasp the key issues in polymer rheology and processing at once through a series of detailed state-of-the-art contributions, which were previously scattered throughout the literature. • Each paper was reviewed by experts and the book editors and some coordination was established in order to achieve a readable and easy access style. • Papers have been grouped in sections covering successively: Molecular dynamics, Constitutive equations and numerical modelling, Simple and complex flows. • Each paper can be read independently. Since the book is intended as an introduction to the main topics in polymer processing, it will be of interest to graduate students as well as to scientists in academic and industrial laboratories.

High-Pressure Rheology for Quantitative Elasto-hydrodynamics, Second Edition, contains updated sections on scaling laws and thermal effects, including new sections on the importance of the pressure dependence of viscosity, the role of the localization limit of stress, and new material on the shear dependence of viscosity and temperature dependence viscosity. Since publication of the original edition, the experimental methods, the resulting property data and new correlations have resulted in a revolution in understanding of the mechanisms of film formation and the mechanical dissipation. Describes lubricant rheology and dependence of lubricant viscosity and density on pressure and temperature Provides a detailed description of the relationship of lubricant properties on pressure, temperature and shear stress Includes data for many more liquids, including the recently characterized reference liquids

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.

This book is designed to fulfill a dual role. On the one hand it provides a description of the rheological behavior of molten polymers. On the other, it presents the role of rheology in melt processing operations. The account of rheology emphasizes the underlying principles and presents results, but not detailed derivations of equations. The processing operations are described qualitatively, and wherever possible the role of rheology is discussed quantitatively. Little emphasis is given to non-rheological aspects of processes, for example, the design of machinery. The audience for which the book is intended is also dual in It includes scientists and engineers whose work in the nature. plastics industry requires some knowledge of aspects of rheology. Examples are the polymer synthetic chemist who is concerned with how a change in molecular weight will affect the melt viscosity and the extrusion engineer who needs to know the effects of a change in molecular weight distribution that might result from thermal degradation. The audience also includes post-graduate students in polymer science and engineering who wish to acquire a more extensive background in rheology and perhaps become specialists in this area. Especially for the latter audience, references are given to more detailed accounts of specialized topics, such as constitutive relations and process simulations. Thus, the book could serve as a textbook for a graduate level course in polymer rheology, and it has been used for this purpose.

Polymer Rheology

A Brief Introduction to the Rheology of Polymeric Fluids

A Guide for Industrial Practice

Structure and Rheology of Molten Polymers

Introduction to Polymer Viscoelasticity

Rheology of Polymer Blends and Nanocomposites: Theory, Modelling and Applications focuses on rheology in polymer nanocomposites. It provides readers with a solid grounding in the fundamentals of rheology, with an emphasis on recent advancements. Chapters explore potential future applications for nanocomposites and polymer blends, giving readers a thorough understanding of the specific features derived from rheology as a tool for the study of polymer blends and nanocomposites. This book is ideal for industrial and academic researchers in the field of polymer blends and nanocomposites, but is also a great resource for anyone who wants to learn about the applications of rheology. Sets out the principles of rheology as it is applied to polymer blends and nanocomposites Demonstrates how rheological techniques are best applied to different classes of nanocomposites Assesses the opportunities and major challenges of rheological approaches to polymer blends and nanocomposites

This book presents an introduction to viscoelasticity, in particular, to the theories of dilute polymer solutions and dilute suspensions of rigid particles in viscous and incompressible fluids. These theories are important, not just because they apply to practical problems of industrial interest, but because they form a solid theoretical base upon which mathematical techniques can be built, from which more complex theories can be constructed, to better mimic material behaviour. The emphasis of this book is not on the voluminous current topical research, but on the necessary tools to understand viscoelasticity. This is a compact book for a first year graduate course in viscoelasticity and modelling of viscoelastic multiphase fluids. The Dissipative Particle Dynamics (DPD) is introduced as a particle-based method, relevant in modelling of complex-structured fluids. All the basic ideas in DPD are reviewed. The third edition has been updated and expanded with new results in the meso-scale modelling, links between the fluid modelling to its physical parameters and new matlab programs illustrating the modelling. Particle-based modelling techniques for complex-structure fluids are added together with some sample programs. A solution manual to the problems is included.

Rheology in Polymer Processing

Rheology of Complex Fluids

Introduction to Polymer Rheology and Processing

Theory and Applications

Viscoelasticity of Polymers