

Hiromi Yamakawa
Takenao Yoshizaki

Helical Wormlike Chains in Polymer Solutions

Second Edition

 Springer

Helical Wormlike Chains In Polymer Solutions

Yakov M Tseytlin



Helical Wormlike Chains In Polymer Solutions:

Helical Wormlike Chains in Polymer Solutions Hiromi Yamakawa, 2012-12-06 A new and general model called the helical wormlike chain for both flexible and semi flexible polymer chains is presented Statistical mechanical hydrodynamic and dynamic theories of their solution properties are developed on the basis of this model There are also given analysis of recent experimental data by the use of these theories for flexible polymers over a wide range of molecular weight including the oligomer region and for semi flexible polymers including biological macromolecules such as DNA The book includes a reasonable number of theoretical equations tables figures and computer aided forms enough to provide understanding of the basic theory and to facilitate its application to experimental data for the polymer molecular characterization **Helical**

Wormlike Chains in Polymer Solutions Hiromi Yamakawa, Takenao Yoshizaki, 2016 This book presents the helical wormlike chain model a general model for both flexible and semiflexible polymer chains It explains how statistical mechanical hydrodynamic and dynamic theories of their solution properties can be developed on the basis of this model This new second edition has been carefully updated and thoroughly revised It includes a new chapter covering Simulation and More on Excluded Volume Effects as well as the discussion of new experimental data and the application of the theory to ring polymers The authors provide analysis of important recent experimental data by the use of their theories for flexible polymers over a wide range of molecular weights including the oligomer region and for semiflexible polymers including biological macromolecules such as DNA This is all clearly illustrated using a reasonable number of theoretical equations tables figures and computer aided forms which support the understanding of the basic theory and help to facilitate its application to experimental data for the polymer molecular characterization Helical Wormlike Chains in Polymer

Solutions Hiromi Yamakawa, Takenao Yoshizaki, 2016-02-22 This book presents the helical wormlike chain model a general model for both flexible and semiflexible polymer chains It explains how statistical mechanical hydrodynamic and dynamic theories of their solution properties can be developed on the basis of this model This new second edition has been carefully updated and thoroughly revised It includes a new chapter covering Simulation and More on Excluded Volume Effects as well as the discussion of new experimental data and the application of the theory to ring polymers The authors provide analysis of important recent experimental data by the use of their theories for flexible polymers over a wide range of molecular weights including the oligomer region and for semiflexible polymers including biological macromolecules such as DNA This is all clearly illustrated using a reasonable number of theoretical equations tables figures and computer aided forms which support the understanding of the basic theory and help to facilitate its application to experimental data for the polymer molecular characterization Polymer Solutions H. Fujita, 2012-12-02 Remarkable progress has been made in the last two decades in the study of concentrated polymer solutions leading to many new concepts theories and techniques in the field of polymer science Any description of the theory of polymer solutions is now insufficient unless both concentrated and dilute solutions

are given equal attention This book reviews recent developments in the study of dilute and concentrated polymer solutions emphasizing mainly the typical equilibrium and steady state dynamic properties of linear homopolymers The author strives to clarify the gap which still remains open between current theories and well documented experimental results thereby stimulating further efforts toward a more accurate understanding of polymer solutions The book contains a collection of typical experimental data and their comparison with current theories molecular or phenomenological a summary of recent advances in the physics of concentrated polymer solutions and melts and an elementary account of the renormalization group theory as applied to dilute solutions Polymer Solutions should prove invaluable as a reference work for graduate students and specialists in this field Flexible Polymer Chains in Elongational Flow Tuan Q. Nguyen,Hans-Henning Kausch,2012-12-06

The behavior of polymer solutions in simple shear flows has been the subject of considerable research in the past On the other hand reports on polymers in elongational flow have appeared comparatively recently in the literature Elongational flow with an inherent low vorticity is known to be more effective in extending polymer chains than simple shear flow and thus is more interesting from the point of view of basic molecular chain dynamics at high deformation and applied polymer science rheology fiber extrusion drag reduction flow through porous media Undoubtly one landmark in the field of polymer dynamics in elongational flow was the notion of critical strain rate for chain extension initially put forward by A Peterlin 1966 and later refined into the coil stretching transition by P G de Gennes and H Hinch 1974 In the two decades which followed significant progress in the understanding of chain conformation in strong flow has been accomplished through a combination of advances in instrumentation computation techniques and theoretical studies As a result of the multidisciplinary nature of the field information on polymer chains in strong flow is accessible only from reviews and research papers scattered in disparate scientific journals An important objective of this book is to remedy that situation by providing the reader with up to date knowledge in a single volume The editors therefore invited leading specialists to provide both fundamental and applied information on the multiple facets of chain deformation in elongational flow **Polymer Physics** Leszek A.

Utracki,Alexander M. Jamieson,2011-02-14 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 Characterization of Polymers in Solution Yo Nakamura,Ken Terao,Tomohiro Hirano,Atsushi Takano,2025-07-28 This book introduces a variety of techniques to characterize polymers in solutions such as if supportLists endif Molecular weight determination by osmotic pressure sedimentation light scattering and matrix assisted laser desorption ionization time of flight mass spectroscopy MALDI TOF MS analyses if supportLists endif Molecular weight distribution by size exclusion chromatography SEC and MALDI TOF MS if

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Topological Polymer Chemistry Yasuyuki Tezuka, Tetsuo Deguchi, 2022-02-25 This book provides a comprehensive description of topological polymers an emerging research area in polymer science and polymer materials engineering The precision polymer topology designing is critical to realizing the unique polymer properties and functions leading to their eventual applications The prominent contributors are led by Principal Editor Yasuyuki Tezuka and Co Editor Tetsuo Deguchi Important ongoing achievements and anticipated breakthroughs in topological polymers are presented with an emphasis on the spectacular diversification of polymer constructions The book serves readers collectively to acquire comprehensive insights over exciting innovations ongoing in topological polymer chemistry encompassing topological geometry analysis classification physical characterization by simulation and the eventual chemical syntheses with the supplementary focus on the polymer folding invoked with the ongoing breakthrough of the precision AI prediction of protein folding The current revolutionary developments in synthetic approaches specifically for single cyclic ring polymers and the topology directed properties functions uncovered thereby are outlined as a showcase example This book is especially beneficial to academic personnel in universities and to researchers working in relevant institutions and companies Although the level of the book is advanced it can serve as a good reference book for graduate students and postdocs as a source of valuable knowledge of cutting edge topics and progress in polymer chemistry

Polymeric Liquids & Networks William W. Graessley, 2003-11-20 Polymeric Liquids and Networks Structure and Properties is the first book of two by William W Graessley that presents a unified view of flexible chain polymer liquids and networks The topics of both volumes range from equilibrium properties to dynamic response finite deformation behavior and non Newtonian flow The second book will be titled Polymeric Liquids and Networks Dynamics and Rheology These various aspects of the field were developed over the past 70 years by researchers from many academic disciplines The infusion of fresh viewpoints continually invigorated and enriched the field making polymeric liquids and networks a truly interdisciplinary subject The lack of a common terminology and perspective however has led to compartmentalization making it difficult for a newcomer even one technically trained to gain a broad appreciation of the field and to see the relationships among its various parts The aim of these two books without diluting the substance is to achieve a desired unity Polymeric Liquids and Networks emphasizes fundamental principles and a molecular viewpoint The conceptual basis of theories underlying each topical area is explained with derivations sometimes

outlined briefly and sometimes given in detail Technical terminology is kept to a minimum necessary for coherent presentation The goal of the text is to provide an informed understanding rather than detailed technical proficiency Theory experiment and simulation are woven together as appropriate for achieving a balanced view The books are designed to serve academic and industrial needs consolidating the understanding of topics with both practical and fundamental significance and written from a technical but non specialized perspective The books deal mainly with non polar and weakly polar species and largely with results derived from experiments on structurally well defined systems The objective is not to ignore

Encyclopedia of Polymer Blends, Volume 1 Avraam I. Isayev, 2016-09-12 A complete and timely overview of the topic this volume of the encyclopedia imparts knowledge of fundamental principles of polymer blends Each article is uniformly structured for easy navigation containing the latest research development and its basic principles and applications

Molecular Interfacial Phenomena of Polymers and Biopolymers P Chen, 2005-07-22 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

Supramolecular Polymers Alberto Ciferri, 2005-04-26 *Supramolecular Polymers* Second Edition details assembly processes and structure function correlation in natural and synthetic self assembling materials focusing on developments occurred over the past five years The book highlights developments in the synthesis of complex structures chemical design principles and theoretical models of

Thermophysics of Polymers I Herbert Baur, 2012-12-06 here Herbert Baur provides a simple description of the theory of thermophysics of polymers In order to illustrate the theoretical skeleton he only treats the simple easily comprehensible problems of polymer physics yet in detail The main points covered are thermally excited conformation isomery of polymers phonon gas of ideal polymer crystals the dissipative thermo mechanical behaviour of polymers new aspects of viscoelastic behavior glass transition and crystallization

Polysaccharides Severian Dumitriu, 2004-11-30 Completely revised and expanded to reflect the latest advancements in the field *Polysaccharides Structural Diversity and Functional Versatility* Second Edition outlines fundamental concepts in the structure function chemistry and stability of polysaccharides and reveals new analytical techniques and applications currently impacting the cosmetic medicinal chemical and biochemical

industries The authoritative book discusses polysaccharides utilized in medical applications such as polysaccharide based hydrogels polysialic acids proteoglycans glycolipids and anticoagulant polysaccharides renewable resources for the production of various industrial chemicals and engineering plastics polysaccharides and more Parallel Computational Fluid Dynamics 2005 A. Deane, Gunther Brenner, David R. Emerson, James McDonough, Damien Tromeur-Dervout, N. Satofuka, A. Ecer, Jacques Periaux, 2006-09-06 The proceedings from Parallel CFD 2005 covering all aspects of the theory and applications of parallel computational fluid dynamics from the traditional to the more contemporary issues Report on current research in the field in an area which is rapidly changing Subject is important to all interested in solving large fluid dynamics problems Interdisciplinary activity Contributions include scientists with a variety of backgrounds *Rheology of Industrial Polysaccharides: Theory and Applications* R. Lapasin, 2012-12-06 Industrial uses of polysaccharides centre on their ability to thicken or structure many times their own weight of water or in other words to control the rheology of hydrated systems Until comparatively recently however objective characterisation of polysaccharide rheology except in a few specialist research laboratories was largely confined to compression of gels simple measurements of solution viscosity often in ill defined geometries and imitative tests intended to reflect product performance in specific areas of end use Several factors have combined to bring a wider range of rheological techniques into common use One is the increasing practical importance of systems that cannot adequately be described as solids or liquids such as weak gels and spreadable pastes fu parallel routine characterisation of such systems has become economically feasible with the development of a new generation of comparatively inexpensive computer controlled instruments There has also been a change of emphasis from phenomenological description of product texture towards the use of rheological measurements to probe the underlying molecular and supramolecular structures and the processes by which they are formed As a result even the most pragmatic producers and users of industrial polysaccharides are probably now familiar with terms such as creep compliance stress overshoot and the ubiquitous G and G although perhaps not fully understanding their precise meaning or practical significance A definitive text giving a rigorous description of the rheological approaches relevant to polysaccharide systems is therefore appropriate and timely Romano Lapasin and Sabrina Priel are to be congratulated for tackling the daunting but worthwhile task of producing such a volume *Smart Polymers* Igor Galaev, Bo Mattiasson, 2007-07-25 The first book to tackle the application of smart polymers in bioseparation and bioprocessing Smart Polymers Applications in Biotechnology and Biomedicine broke new ground in this challenging field Completely revised updated and following in the footsteps of its predecessor the second edition is poised to take its place as a premier reference **Advanced Mechanical Models of DNA Elasticity** Yakov M Tseytlin, 2016-04-08 Advanced Mechanical Models of DNA Elasticity includes coverage on 17 different DNA models and the role of elasticity in biological functions with extensive references The novel advanced helicoidal model described reflects the direct connection between the molecule helix structure and its specific properties

including nonlinear features and transitions It provides an introduction to the state of the field of DNA mechanics known and widely used models with their short analysis as well as coverage on experimental methods and data the influence of electrical magnetic ionic conditions on the persistence length and dynamics with viscosity influence It then addresses the need to understand the nature of the non linear overstretching transition of DNA under force and why DNA has a negative twist stretch coupling Includes coverage of 17 contemporary models of DNA mechanics with analysis Provides comparison of DNA and RNA mechanical features Covers advances in experimental techniques including AFM X ray and optical tweezers Contains extensive references for further reading

Molecular Characterization of Polymers Muhammad Imran

Malik,Jimmy Mays,Muhammad Raza Shah,2021-03-09 Molecular Characterization of Polymers presents a range of advanced and cutting edge methods for the characterization of polymers at the molecular level guiding the reader through theory fundamentals instrumentation and applications and supporting the end goal of efficient material selection and improved material performance Each chapter focuses on a specific technique or family of techniques including the different areas of chromatography field flow fractionation long chain branching static and dynamic light scattering mass spectrometry NMR X Ray and neutron scattering polymer dilute solution viscometry microscopy and vibrational spectroscopy In each case in depth coverage explains how to successfully implement and utilize the technique This practical resource is highly valuable to researchers and advanced students in polymer science materials science and engineering and to those from other disciplines and industries who are unfamiliar with polymer characterization techniques Introduces a range of advanced characterization methods covering aspects such as molecular weight polydispersity branching composition and tacticity Enables the reader to understand and to compare the available technique and implement the selected technique s with a view to improving properties of the polymeric material Establishes a strong link between basic principles characterization techniques and real life applications

Carbon Bonding and Structures Mihai V. Putz,2011-08-27 Carbon Bonding and Structures Advances in Physics and Chemistry features detailed reviews which describe the latest advances in the modeling and characterization of fundamental carbon based materials and recently designed carbon composites Significant advances are reported and reviewed by globally recognized experts in the field The quantification indexing and interpretation of physical and chemical patterns of carbon atoms in molecules crystals and nanosystems is presented Carbon Bonding and Structures Advances in Physics and Chemistry will be primarily of interest to theoretical physical chemists and computational materials scientists based in academia government laboratories and industry

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