Statistical Physics of Polymers

An Introduction

This book is an introductory textbook on the statistical mechanics of poly mers and complex fluids aimed at senior undergraduate and graduate stu dents and non-specialist researchers who are starting research in this field. Modern statistical mechanics on polymers and complex fluids is based on many fields, such as chemical physics, statistical mechanics, quantum me chanics, stochastic processes, theory of phase transitions, hydrodynamics, rheology, and so on. This book provides an overview of the basic concepts and methods used in current research on the physics of polymers and complex fluids. Using simple but essential examples, we describe how to derive the physical properties of polymers theoretically, focusing on the structure and dynamics on mesoscopic scales. Here, the term 'mesoscopic scales' means intermediate lengths and time scales between the microscopic atomic scale and the macroscopic scale. Properties on mesoscopic scales are the central issue of the physics of polymers and complex fluids, because these materials are well characterized by spatiotemporal structures on these scales, where we can extract universal properties that are independent of the microscopic details of the system.

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