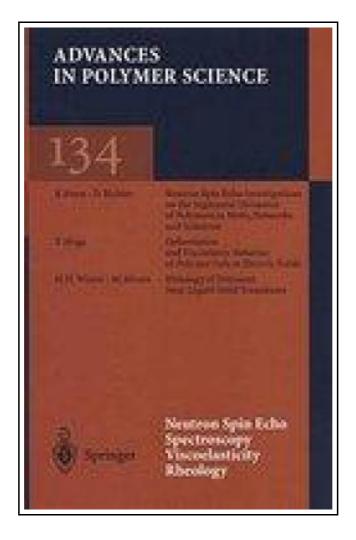
# Neutron Spin Echo Spectroscopy Viscoelasticity Rheology



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(Prof. Damien Schuster PhD)

## NEUTRON SPIN ECHO SPECTROSCOPY VISCOELASTICITY RHEOLOGY



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Springer Okt 2013, 2013. Taschenbuch. Book Condition: Neu. 235x155x14 mm. This item is printed on demand -Print on Demand Neuware - Viscoelasticandtransportpropertiesofpolymersintheliquid(solut ion, melt) or liquidlike (rubber) state determine their processing and application to a large extent and are of basic physical interest [1-3]. An understanding of these dynamic properties at a molecular level, therefore, is of great importance. However, this understanding is complicated by the facts that di erent motional processes may occur on di erent length scales and that the dynamics are governed by universal chain properties as well as by the special chemical structure of the monomer units [4,5]. The earliest and simplest approach in this direction starts from Langevin equations with solutions comprising a spectrum of relaxation modes [1-4]. Special features are the incorporation of entropic forces (Rouse model, [6]) which relax uctuations of reduced entropy, and of hydrodynamic interactions (Zimm model, [7]) which couple segmental motions via long-range back ow elds in polymer solutions, and the inclusion of topological constraints or entanglements (reptation or tube model, [8-10]) which are mutually imposed within a dense ensemble of chains. Another approach, neglecting the details οf the chemical structure and concentrating on the universal elements of chain relaxation, is based on dynamicscalingconsiderations[4,11].Inparticularinpolymersolutions, this approach o ers an elegant tool to specify the general trends of polymer dynamics, although it su ers from the lack of a molecular interpretation. A real test of these theoretical approaches requires microscopic methods, which simultaneously give direct access to the space and time evolution of the segmental di usion. Here, quasi-elastic scattering methods play a crucial role since the yallow the measurement of the corresponding correlation functions. Inparticular, the highresolutionneutronspinecho(NSE)spectroscopy[12-15]is very suitable for such investigations since this method covers an appropriate range in time (0.005)t/ns)40) and space (r/nm [15). Furthermore, the possibilityoflabellingbyhydrogen-deuteriumexchangeallowstheobservation of single-chain behavior even in the



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