MAR05-2004-002300

Abstract for an Invited Paper
for the MAR05 Meeting of
the American Physical Society

A primitive path analysis of entangled polymer melts and networks

RALF EVERAERS, Max-Planck-Institut für Physik komplexer Systeme, Nöthnitzerstr. 38, 01187 Dresden, Germany

Computer simulations provide unprecedented access to the microscopic structure and dynamics of polymeric systems. In particular, they are an ideal tool to study and analyze topological constraints on the dynamics of entangled polymer chains which can slide past but not through each other. We (i) show how the microscopic foundation of the tube model can be established by analyzing the topological state of polymeric liquids in terms of primitive paths, (ii) provide a unified view on loosely and tightly entangled systems, (iii) present an extension of the tube model to polymer networks which is (iv) shown to describe the microscopic and macroscopic response to strain of randomly end-linked and randomly cross-linked networks and (v) discuss the interpretation of scattering experiments addressing these issues.