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Topological effects on viscoelasticity of polyacrylamide hydrogels

JAN KALFUS, ALAN LESSER — Viscoelastic behavior of long linear chains in a concentrated solution is governed by the topology of the molecules and interchain excluded volume interaction. As a consequence, chain diffusive motion is significantly retarded and such an assembly of chains exhibits highly pronounced entropy elastic behavior. In this contribution, two types of additional chain confinements imposed on a concentrated solution of linear polyacrylamide (L-PAA) will be discussed. The confinement was realized either by adding silica nano-filler into the concentrated solution of L-PAA or by cross-linking of acrylamide in the concentrated solution of L-PAA. While in the first case the trapped entanglement interaction is caused by interaction of chains with large nano-filler surface, in the second case the L-PAA chains are trapped among the cross-links of the PAA network. Viscoelastic response of both types of composite systems exhibited generic characteristics. In both cases, the trapped entanglement interaction significantly changed the relaxation spectrum of the matrix polymer solution and considerably enhanced the linear elastic modulus.

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