

Field-cycling nuclear magnetic resonance relaxometry of thermoreversible polybutadiene networks

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Abstract

Chain dynamics in thermoreversible polybutadiene networks were studied in comparison to linear polybutadiene using field-cycling NMR (nuclear magnetic resonance) relaxometry. The effect of rapidly fluctuating cross links on the chain mode relaxation time is shown to result in dynamics rescaled according to a new effective segmental friction coefficient. The frequency dependence of the spin-lattice relaxation time consists of a sequence of three regions characterized by power laws with exponents 0.5 ± 0.05 , 0.25 ± 0.05 , and 0.44 ± 0.05 from high to low frequencies (and low to high temperatures). Thermoreversible cross-linking shifts the crossover frequencies toward lower values. In our previous work on linear polymers these frequency dependences were shown to be a consequence of the once (or twice) renormalized Rouse theory. The same formalism can be used for the thermoreversible polybutadiene networks by rescaling the segmental relaxation time. © 1997 American Institute of Physics.
