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Miscible Polyisoprene/Polystyrene Blends: An Unusual Combination of Heterogeneous Segmental Dynamics and Homogeneous Diffusion YIYONG HE, TOM LUTZ, MARK EDIGER, Dept. of Chemistry, University of Wisconsin-Madison, MARINOS PITSIKALIS, NIKOS HADJICHRISTIDIS, Dept. of Chemistry, University of Athens, ERNST VON MEERWALL, Dept. of Physics, University of Akron — The segmental and terminal dynamics of each component in miscible blends of polyisoprene (PI) and polystyrene (d_3 PS) were characterized over a wide temperature and composition range. Though the system has a large positive interaction parameter χ up to 0.15, it is miscible in the temperature range of study due to selected low molecular weight. C-13 and H-2 NMR relaxation measurements were performed to extract the segmental dynamics. Pulse-gradient spin-echo NMR was used to determine the diffusion coefficients. Though the segmental dynamics of PI and PS components differ by more than 2 decades at T_g+50 K, their terminal dynamics (monomeric friction) are identical. We know of no other system with zero to positive χ showing this feature. The distinct component segmental dynamics can be reasonably interpreted by the Lodge/McLeish model. The unusual homogeneous terminal dynamics are most likely due to a large thermodynamic barrier to diffusion.

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