Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Challenging Slip-Link Models: Predicting the Linear Rheology of 1,4-Polybutadiene Blends of Well-Characterized Star and Linear 1,4-Polybutadienes MARIA KATZAROVA, Illinois Institute of Technology, PRIYANKA DESAI, University of Michigan, BEOMGOO KANG, University of Tennessee, RYAN HALL, QIFAN HUANG, University of Michigan, SANGHOON LEE, TAIHYUN CHANG, Pohang University of Science and Technology, DAVID VENERUS, Illinois Institute of Technology, JIMMY MAYS, University of Tennessee, JAY SCHIEBER, Illinois Institute of Technology, RONALD LARSON, University of Michigan — The discrete slip-link model (DSM) is a single-chain mean-field model for entanglement-dominated polymer dynamics. The model has been used successfully to make predictions about the linear and nonlinear rheology of monodisperse homopolymer melts, polydisperse melts, or blends. By using recent advances in coarse-graining, hierarchical modeling, and graphics processors, the model is amenable to predictions of well-entangled branched polymers. Here, the parameters of the most coarse-grained member of the hierarchy are fit to the dynamic modulus of monodisperse linear chains and applied to symmetric 4-arm polybutadiene (PBd) star-linear blends with roughly 20 entanglements per star arm, but with no parameter adjustment. Agreement with data is quantitative. This detailed model is further used to examine assumptions and approximations typically made in tube models for blending, including factorization in the time domain. Failure of these assumptions point towards possible fixes to tube models.

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Date submitted: 05 Nov 2015 Electronic form version 1.4