

Abstract Submitted
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Universal Scaling of Linear and Nonlinear Rheological Properties of Semidilute and Concentrated Polymer Solutions RONALD LARSON, YOUNGSUK HEO, University of Michigan — We examine the validity of the de Gennes “blob” concept in predicting linear and nonlinear rheological properties of semidilute polystyrene solutions in tricresyl phosphate (TCP). At a fixed value of rescaled concentration c/c_e where c_e is the entanglement concentration, below a critical value of around 2.0 for our polystyrene/TCP solutions, linear and nonlinear rheological functions superimpose after the modulus and the frequency (or shear rate) of each solution are respectively normalized with the concentration-dependent plateau modulus and the equilibration time obtained from the de Gennes scaling relationships using the literature value of the solvent-quality exponent 0.53. However, once the polymer volume fraction exceeds the “swelling volume fraction, above which the polymer takes on a random walk configuration on all length scales even in a good solvent, this universal scaling breaks down and the polymer conformation appears to be governed by Colby-Rubinstein’s scaling laws for theta solutions. We estimate that all polybutadiene solutions in phenyl octane (a good solvent) from the work of Colby *et al.* are above the swelling concentration and can be scaled using theta solvent scaling laws for concentrations ranging all the way up to the melt, showing universal behavior of melts and solutions above the swelling concentration.

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