Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Viscosity of "Nanoparticle"/Polymer Mixtures JOHN G. CURRO, University of New Mexico, AMALIE L. FRISCHKNECHT[1], Sandia National Laboratories — Recently it has been observed by Tuteja et al. (Macromolecules 38, 8000 (2005)) that when single crosslinked polystyrene macromolecules (nanoparticles) are added to sufficiently high molecular weight linear polystyrene melts, the viscosity of the mixture decreases in apparent contradiction to Einstein's law of viscosity of dilute suspensions. We propose that this unexpected behavior can be understood by considering the system as a miscible polymer blend rather than a suspension. An approximate formulation for the blend viscosity is developed based on an additive mixing rule using the Rouse and reptation models for the linear melt at low and high molecular weights respectively. This theory predicts that upon addition of crosslinked macromolecules, the mixture viscosity increases (decreases) for low (high) molecular weights of the linear chain component in qualitative agreement with experiment. Moreover, the effect of the molecular weight of the crosslinked macromolecules on the mixture viscosity was in accordance with the data of Tuteja and coworkers.

[1]Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company for the US DOE's NNSA under Contract No. DE-AC04094AL85000.

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Date submitted: 04 Dec 2006 Electronic form version 1.4