Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Inter- and Intra-Molecular Interactions of Associative Polymers in Solution M. WEI, R. DAVID, JULIE KORNFIELD, Caltech — Model polymers with matched backbone length are used to examine the effects of degree of functionalization and type of interaction (self-associating or donor-acceptor) on shear and extensional rheology of associative polymer solutions. Series of polymers were prepared by functionalization of 500 and 1300 kg/mol polybutadiene chains with carboxylic acid side groups (A stickers, self-associating) and tertiary amine side groups (N stickers, forming strong hydrogen donor-acceptor interactions with A stickers). We found that stickers drive phase separation at extents of functionalization as low at 0.5 mol%. Intramolecular associations dominated the behavior of A-functionalized chains even at semi-dilute concentrations, leading to chain collapse and reduced shear and extentional viscosities. Finally, we found that intermolecular interactions were much more favorable for dilute mixtures of A-functionalized and N-functionalized chains (as evidenced by increased zero-shear viscosity and by the formation of large aggregates), but that associations still reduced solution elasticity and extentional viscosity in elongational flow.

Julie Kornfield
Caltech

Date submitted: 27 Nov 2007 Electronic form version 1.4