

Abstract Submitted  
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**Composition Dependency of the Flory-Huggins  $\chi$  Parameter in Isotopic Polymer Blends**<sup>1</sup> TRAVIS RUSSELL, BRIAN EDWARDS, BAMIN KHOMAMI, University of Tennessee — Flory-Huggins Theory has been the basis for understanding polymer solvent and blended polymer thermodynamics for much of the last 50 years. Within this theory, a parameter ( $\chi$ ) was developed to account for the energy of dispersion between distinct components. Thin film self-assembly of block copolymers and polymer melts depends critically on this parameter, and in application,  $\chi$  has generally been assumed to be independent of the concentrations of individual components in the system. However, Small Angle Neutron Scattering data on isotopic polymer blends, such as polyethylene and deuterated polyethylene, have shown a parabolic concentration dependency for  $\chi$ . In order to better understand the nature of  $\chi$  and develop more accurate morphological data for polymer systems, an investigation of this concentration dependency was undertaken from both structural ( $\chi$ S) and thermodynamic ( $\chi$ T) theories. Structural calculations for  $\chi$ S were based on the Random Phase Approximation of de Gennes, and thermodynamic information was obtained through integration of the free energy with  $\chi$ T defined using original Flory-Huggins Theory. Comparison of the two theories revealed that while both  $\chi$ S and  $\chi$ T possess a composition dependence, it is not the same.

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