

Abstract Submitted
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The Structure and Thermodynamics of Cellulose Acetates.

MARK DADMUN, RUJUL MEHTA, University of Tennessee, GARY LYNN, Oak Ridge National Laboratory — Cellulose acetate (CA) polymers having different degrees of substitution (DS) vary widely in their properties, such as glass transition, miscibility, chemical resistance, and gas permeation. These variations hint at differences in their molecular structure. We have systematically studied the variation in the molecular structure of CA with DS, utilizing small angle neutron scattering (SANS). SANS measurements were carried out in 1% (w/v) solutions in dDMSO (which is sufficiently dilute to avoid intermolecular scattering). The polymer chains display rigidity along their main chain and have persistence lengths in the range of 12 to 14 nm. The effect of DS on the extent of miscibility is explained on the basis of available intra-molecular hydrogen bonding sites along the polymer chain. SANS measurements were also carried out on 50-50(w/w) miscible blends of two sets of CA, where the difference in the DS between the polymers varied from 0.05 to 0.25. Random phase approximation analysis provides an estimate of the Flory-Huggins interaction parameter between the two polymers in the blend. The influence of both the amount of substitution and hydrogen bonding on the polymer miscibility will be discussed.

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