

Abstract Submitted
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Phase behavior of poly(ethylene oxide) in ethyl alcohol / water mixtures S. H. SHIN, R. M. BRIBER, University of Maryland at College Park, B. HAMMOUDA, D. L-T HO, National Institute of Standards and Technology — PEO in ethanol forms an opaque gel-like mixture with a partial crystalline structure. Addition of a small amount of water disrupts the gel: 5% PEO in ethanol with the addition of 4% water becomes a transparent solution. We have studied the phase behavior of PEO in mixed solvents using small angle neutron scattering (SANS). PEO solutions (5% PEO) which have more than 4-10 % water behave as an athermal polymer solution and the phase behavior changes from UCST to LCST rapidly as the fraction of water is increased. The proposed origin of this unusual phase behavior comes from the formation of a hydration layer around the PEO chain. Two water molecules can hydrate one PEO monomer which is consistent with the suppression in the crystallization and change in the phase behavior observed by SANS. We measured the spinodal temperature and phase behavior of PEO solutions with different concentrations of PEO (2% PEO and 10% PEO) in the mixed water/ethanol solvent system to assess the role of hydration. The observed phase behavior is consistent with a hydration layer forming upon the addition of water and the system shifting from UCST to LCST behavior. The amount of water necessary to form a hydration layer around PEO chains varies in a self-consistent manner as the PEO concentration increases from 2 to 10%.

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