

Abstract Submitted  
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**Small Angle Neutron Scattering of poly (ethylene oxide) ethyl alcohol / water mixtures** SANG HAK SHIN, ROBERT BRIBER, Materials Science and Engineering, University of Maryland, College Park, MD 20742, BOUALEM HAMMOUDA, DEREK HO, National Institute of Standards and Technology, Gaithersburg, MD 20899 — PEO solutions have interesting and complex features which arise from the interplay of the hydrophilic and hydrophobic sites on the chain (the oxygen atom and alkyl group respectively). PEO in ethanol forms an opaque gel-like mixture with a partial crystalline structure as confirmed by wide angle X-ray scattering. Addition of a small amount of water disrupts the gel: PEO in ethanol with 4 vol % water becomes a transparent solution. We confirmed the crystalline structure of PEO in ethanol and investigated the PEO chain conformation in mixed ethyl alcohol / water solutions using small angle neutron scattering (SANS). We also measured the phase behavior and spinodal temperature of PEO solutions in these mixed solvents with SANS. The phase behavior changes from an upper critical solution temperature (UCST) to a lower critical solution temperature (LCST) as the fraction of water is increased. The thermodynamic behavior changes from an UCST to LCST between 5~9% volume fraction water. PEO solutions which have more than 4~10 vol % water behave as an athermal polymer solution. The proposed origin of this unusual phase behavior comes from the formation of hydration layer around the PEO chain.

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