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Re-entrance of Poly(N,N-diethylacrylamide) in D_2O/d-Ethanol Mixture at 27 °C.[1] HE CHENG, Institute of High Energy Physics CAS — The re-entrance of poly(N,N-diethylacrylamide) (PDEA) in D_2O/d-ethanol mixtures (i.e., the coil-to-spherical aggregates-to-coil transition) has been observed at 27 °C by small-angle neutron scattering (SANS). PDEA has a lower critical solution temperature (LCST) phase diagram in the D_2O rich region and is soluble in the D_2O-poor region for all of the observed temperature ranges. Its spinodal temperature decreases first from 33.5 °C in pure D_2O to 26.7 °C in 80% D_2O/ 20% d-ethanol and then increases to 283.1°C in 50% D_2O/50% d-ethanol With the further decrease of D_2O content, PDEA dissolves well, and its phase boundary can no longer be observed by SANS. The ternary random phase approximation model (RPA) is used to analyze the SANS profiles, and three Flory−Huggins interaction parameters ($\chi_{\mathrm{PDEAdethanol}}$, χ_{PDEAD2O} and $\chi_{\mathrm{dethanolD2O}}$) are obtained. When a small amount of d-ethanol is added to the system, it has a strong interaction with D_2O, so it directly gets distributed into the water structure and makes a negative contribution to the dissolution of PDEA ($\chi_{\mathrm{dethanolD2O}}$ is much smaller than$\chi_{\mathrm{PDEAdethanol}}$ and χ_{PDEAD2O}). Neither d-ethanol nor D_2O wants to help the dissolution of PDEA in the first place, until the structure of mixed solvents tends to be pure d-ethanol in the D_2O-poor region.

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