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Structure and dynamics of supramolecular poly(ethylene) oxide polymer blends

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In this work, we present a combined analysis of small angle neutron scattering (SANS), linear rheology and neutron spin eco (NSE) spectroscopy experiments on the supramolecular association and chain structure of supramolecular polymer blends. These consist of well-defined hydrogenated (H) polymers with a polyethylene oxide (PEO) backbone carrying the directed homocomplementary hydrogen-bonding functional end-group, ureidopyrimidinone (upy), immersed in their own deuterated (D) covalent short linear non-functionalized PEO chains in the melt as solvent. The molar mass (MW) of the functionalized (H) PEO is 2000 gmol-1, and of the non-functionalized (D) PEO chains 500 gmol-1. Their self-assembly and phase behavior in the melt state is investigated as a function of temperature and supramolecular polymer mass fraction in the ideal blend. It is found that on contrary to the bulk structure in the melt [1], the supramolecular polymer in the blend is well described by the Gaussian model. In particular, the conformation of the supramolecular polymer in the blend changed from linear to ring -like with increasing supramolecular polymer mass fraction. These findings are also confirmed by the NSE analysis with the modified Rouse model for ring polymers from which the expected diffusion and segmental friction is obtained [2,3].

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