Title: Stimuli Responsive Multicomponent Polymer Systems

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Abstract: Combination of ^{1}H NMR spectroscopy, differential scanning calorimetry (DSC), dynamic mechanical measurement, and optical microscopy was used to investigate temperature-induced phase transition of three types of systems: i) in D_2O solutions of poly(*N*-isopropylmethacrylamide-co-acrylamide) (P(NIPMAm/-AAm)) random copolymers and in interpenetrating networks ii) poly(*N*-isopropylmethacrylamide/poly(*N*-isopropylacrylamide) (PNIPMAm/PNIPAm), and iii) poly(vinylcaprolactam)/poly(*N*-isopropylacrylamide) (PVCL/PNIPAm). In all systems influence of composition of the system on the phase transition was studied. For i) both the NMR and DSC data showed dependence on the acrylamide (AAm) content in the copolymer. NMR data was used to construct van't Hoff plots and changes of the enthalpy ΔH and entropy ΔS were studied. As it follows from comparison of ΔH values for NMR and DSC the size of the domains undergoing the transition as a whole decreases with increasing AAm content in the copolymer. For ii) all methods showed phase transition starting at 307 K, which is the volume phase transition temperature of PNIPAm, the major network component. Generally, samples with higher PNIPAm content show a single transition in NMR and DSC which indicates enhanced mutual entanglement of both components. In all samples, the phase transition results in substantial increase of both components of the shear modulus. For hydrogels of IPNs PVCL/PNIPAm containing not more than 50 mol% of PNIPAm monomer units (iii) a single endothermic peak was detected by DSC but separate and somewhat different transitions were revealed and explained for both components by NMR.

Keywords: phase transition, polymer solution, interpenetrating networks, ^{1}H NMR spectroscopy, DSC