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Influence of temperature and concentration on the solution phase behavior of poly(N-isopropylacrylamide) homopolymers

Poly(N-isopropylacrylamide) (PNIPAM) is a well-known thermoresponsive polymer showing a lower critical solution temperature (LCST) of approximately 32°C in water. Below the LCST, PNIPAM is commonly believed to be well-hydrated with a Gaussian coil conformation. Above the LCST polymer-water interactions become unfavorable leading to the release of water and the well-known coil-to-globule transition. In this contribution we present a study on the solution phase behavior of PNIPAM homopolymers in different solvents as a function of external parameters. For this we synthesized PNIPAM homopolymers by RAFT-polymerization resulting in α -dodecyltrithiocarbonate- ω -carboxyl-terminated chains with different numbers of repetition units ranging from 80 to 250. We investigated the phase behavior of these homopolymers in water using dynamic light scattering (DLS) and small angle neutron scattering (SANS). Below the LCST, both methods revealed structures that do not correspond to Gaussian coils of single chains. The latter are only observed in tetrahydrofuran as dispersion medium. To get more insights into the interaction of the chains and structures we performed a detailed study of the phase behavior in dependence on the degree of polymerization, end group, concentration and temperature by SANS.

Preferred topic

Conformation of polymers in solvents

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