

CPP 56: Colloids and Complex Liquids IV

Stabilization

Time: Friday 9:30–10:30

Location: ZEU 260

CPP 56.1 Fri 9:30 ZEU 260

Form fluctuations of polymer loaded spherical microemulsions — ●BJÖRN KUTTICH¹, PETER FALUS², ISABELLE GRILLO², and BERND STÜHN¹ — ¹Experimental Condensed Matter Physics, TU Darmstadt, Germany — ²Institut Laue-Langevin, Grenoble, France

Spherical microemulsions with the anionic surfactant AOT are well suited as model system with a soft confining geometry. Their structural and dynamical properties are already intensively studied by various scattering methods and the droplet radius, determining the confinement size, can easily be tuned by the precise composition of the microemulsion. A first approach of applying this confinement to complex molecules is the investigation of small simple polymers like PEO in the microemulsions droplets. Besides the influences of the polymer on the phase diagram of the microemulsion, changes in the droplet dynamics are of great interest.

Neutron spin echo spectroscopy is a unique method to investigate the fluctuations of the microemulsions surfactant shell and how they are influenced by the presence of polymers. Droplet phase Water/AOT/Octane microemulsions with different radii and polymer content were investigated at the ILL at IN15, their droplet structure was secured by SANS on D11. Measuring the relaxation rate of the fluctuations the bending modulus of the shell can be determined by hydrodynamic calculations and a softening of the shell with addition of polymer is observed. This finding is complemented by percolation temperature measurements by dielectric spectroscopy.

CPP 56.2 Fri 9:45 ZEU 260

Rationalizing Polymer Swelling and Collapse under Attractive Cosolvent Conditions — ●JAN HEYDA¹ and JOACHIM DZUBIELLA^{1,2} — ¹Soft Matter and Functional Materials, Helmholtz-Zentrum Berlin, Hahn-Meitner Platz 1, 14109 Berlin, Germany — ²Department of Physics, Humboldt-University Berlin, Newtonstr. 15, 12489 Berlin, Germany

The collapse and swelling behavior of a generic homopolymer is studied using implicit-solvent, explicit-cosolvent Langevin dynamics computer simulations for varying interaction strengths. Maximal swelling is observed if both monomer-monomer and monomer-cosolute interactions are weakly attractive. In the most swollen state the cosolute density inside the coil is remarkably bulk-like and homogenous. Highly attractive monomer-cosolute interactions, induce a chain collapse with considerably enhanced cosolute density within the globule, in strong contrast to the collapse in purely repulsive cosolvents. Thus, similarly appearing collapsed states may result from very different mechanisms with distinct final structural and thermodynamics. Two theoretical models, one based on an effective one-component description, and a fully two-component Flory – de Gennes like model, are in accord with simulation findings. In particular, the polymer collapse in highly attractive cosolvents driven by crosslinking-like bridging effects is reproduced. Next, swelling is predicted only for not too short-ranged interactions. Our findings has implications for cosolute effect on conformations of biomolecules, in particular for highly attractive cosolutes, such as urea, GdmCl, NaI, or NaClO₄ near peptide-like moieties.

CPP 56.3 Fri 10:00 ZEU 260

Conosolvency in P(S-*b*-NIPAM) diblock copolymers - a time-resolved SANS study of the aggregation process — ●KONSTANTINOS KYRIAKOS¹, MARTINE PHILIPP¹, JOSEPH ADELSBERGER¹, SEBASTIAN JAKSCH¹, ISABELLE GRILLO², ANNA MIASNIKOVA³, ANDRÉ LASCHEWSKY³, PETER MÜLLER-BUSCHBAUM¹, and CHRISTINE M. PAPADAKIS¹ — ¹TU München, Physik-Department, Garching — ²Institut Laue-Langevin, Grenoble, France — ³Universität Potsdam, Institut für Chemie, Potsdam-Golm

In mixtures of water and methanol, the thermoresponsive poly(N-isopropylacrylamide) (PNIPAM) exhibits the conosolvency effect, i.e. an enhanced tendency for phase separation at certain solvent compositions. The amount of consolvent may have a severe effect on the pathway of the collapse of the PNIPAM chain and the subsequent aggregation into mesoglobules, in line with previous experiments where aqueous solutions of PNIPAM were heated through the cloud point.

We report here on time-resolved small-angle neutron scattering experiments during the rapid addition of methanol to aqueous solutions of P(S-*b*-NIPAM). These block copolymers form core-shell micelles with a thermoresponsive shell. Small aggregates are formed very rapidly and growth with time reaching a certain size. The kinetics of this aggregation path depends on the amount of methanol. The observed growth process can be adequately described by the diffusion-limited coalescence model, and proceeds in a different way than previously observed in temperature jumps across the cloud point [1].

[1] Adelsberger, J. et al. *SoftMatter* **9**, 1685 (2013)

CPP 56.4 Fri 10:15 ZEU 260

Dehydration behavior of phase separating PNIPAM solutions — ●MARTINE PHILIPP¹, KONSTANTINOS KYRIAKOS¹, LUCA SILVI^{1,2}, WIEBKE LOHSTROH^{1,2}, WINFRIED PETRY^{1,2}, JAN K. KRÜGER³, CHRISTINE M. PAPADAKIS¹, and PETER MÜLLER-BUSCHBAUM¹ — ¹TU München, Physik-Department, LS Funktionelle Materialien/FG Physik weicher Materie, Garching, Germany — ²TU München, MLZ, Garching, Germany — ³Université du Luxembourg, LPM, Luxembourg, Luxembourg

A structural instability leads to the collapse and aggregation of poly(N-isopropyl acrylamide) (PNIPAM) in aqueous environment at an LCST-type demixing transition. This transition is provoked by the interplay of H-bond and hydrophobic interactions between PNIPAM and water. The cooperative dehydration of PNIPAM plays a key role for the genesis of the PNIPAM-rich globules. Using quasi-elastic neutron scattering, we elucidate for the first time the partial dehydration process of PNIPAM in a concentrated solution. As the hydration number decreases from 8 to 2 during phase separation, the PNIPAM-rich globules contain at most 75 mass% PNIPAM. First insights into the relationship between the molecular dehydration process and the ensuing macroscopic changes of order parameter susceptibilities are presented for dilute to concentrated PNIPAM solutions, studying the volume expansion coefficient and compressibility [1,2].

[1] M. Philipp et al., *Soft Matter* **8**, 11387 (2012)

[2] M. Philipp et al., *Soft Matter* **9**, 5034 (2013)