**SANS/USANS determination of hierarchical structure of self-organized polymer microemulsions**

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We demonstrate that self-organized soft polymer systems exhibit only limited long-range order. Self-organized microemulsions of diblock copolymers in partially miscible solvents form hollow micelles that, depending on the symmetry of polymer, self-assemble into a hexagonal or cubic phase, as shown by small-angle neutron scattering. Using small-angle X-ray scattering, the cubic phase was identified as body-centered. Polymer blocks extending from the cylindrical or spherical micelles into the majority solvent are slightly extended compared to excluded-volume conformation. Long-range order is limited to a length scale of several microns, as documented by ultra-small-angle neutron scattering; on larger scale the system is disordered.

In a melt of a soft symmetric diblock copolymer (without solvent) the SAXS pattern exhibits diffuse scattering around Bragg peaks that was analyzed using the Caillé formalism yielding the bulk compression modulus of the lamellar phase. Comparing the values to complementary results obtained by dynamic light scattering on a double goniometer DLS setup we have shown that the lamellar structure is not perfect but exhibits mosaicity. The self-organized lamellar diblock copolymer melt thus has a grainy long-range structure similar to that observed in the block copolymer solutions.