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Structure and Dynamics Polyelectrolyte/Microemulsion Complexes (PEMECs) Studied by Neutron Scattering

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Mixtures of oppositely charged polyelectrolytes (PE) with oppositely charged microemulsion (ME) droplets were studied with respect to their phase behavior and the structures present in solution. In this work we varied the size of the ME droplets, their charge density, the mixing ratio, ionic strength of the solution, and the type and Mw of the PE. Their structural properties were characterized by means of static and dynamic light scattering, zeta-potential measurements, and as main methods by small angle neutron scattering (SANS) and neutron spin-echo (NSE).

In the phase behavior a systematic dependence on the Mw of the polyelectrolyte was observed. Depending on the mixing ratio different elongated structures of connected droplets are observed, whose elongation depends on the Mw and choice of the polyelectrolyte.

The interconnected nature of the droplet aggregates leads to changes in dynamics which were studied using pulsed field gradient NMR (PFGNMR), neutron spin-echo (NSE) spectroscopy and fluorescence correlation spectroscopy (FCS), thereby yielding detailed insights into the dynamic aspect of such mixed colloidal systems.

These experiments give a comprehensive picture of the formed complexes and allow for a detailed understanding of the interactions between charged ME droplets and PEs. With their high solubilization capacity they are interesting for potential applications in formulations, which require optimized delivery.

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