Self-assembled amphiphilic block copolyelectrolytes investigated by SANS

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When dissolved in a selective solvent for the A block at a sufficiently high concentration, triblock copolymers of BAB type form 3D networks consisting of hydrophobic microdomains of the B blocks connected by A bridges. The rheological properties of these networks depend to a large extent on the lifetime of the bridges i.e. the dynamic exchange of the B blocks between the hydrophobic microdomains. Amphiphilic copolymers are however usually in a frozen state in aqueous medium, so that the exchange of B blocks between the hydrophobic microdomains is immeasurably slow and permanently cross-linked hydrogels are obtained.

It was recently shown for BAB triblock copolymers based on a poly(acrylic acid) (PAA) hydrophilic A block and hydrophobic B blocks consisting of randomly distributed n-butyl acrylate (nBA) and AA units that the incorporation of hydrophilic AA units within the B blocks resulted in dynamic rather than frozen networks. Moreover, the pH-sensitive character of the AA units allowed control of the exchange dynamics over more than 10 decades by changing the pH or the AA content of the self-assembled block copolyelectrolytes. We will report on results from scattering techniques and especially SANS that help at elucidating the ‘living’ nature of such self-assemblies.

7 Shedge, A.; Colombani, O.; Nicolai, T.; Chassenieux, C. Charge Dependent Dynamics of Transient Networks and Hydrogels Formed by Self-Assembled pH-Sensitive Triblock Copolyelectrolytes. Macromolecules 2013, 47, (7), 2439-2444.