Structure of salt-free aqueous solutions of star polyelectrolytes

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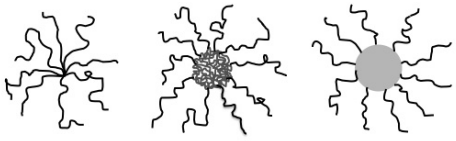
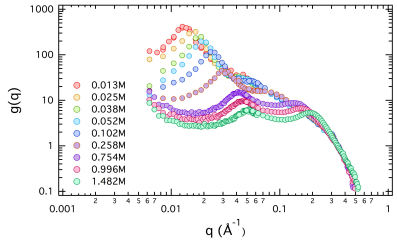
Star polymers are branched macromolecules consisting of several identical linear chains linked to a very small central core. They can be considered as model systems for branched macromolecules and show large similarities with block copolymers micelles or polymer-coated colloids. In dilute solutions, the arms are stretched in comparison with equivalent isolated linear chains due to the inter-arm repulsive interactions[1]. In the case of star branched polyelectrolytes (PEs), the stretching of the arms is even stronger[2]. This effect is related to the electrostatic repulsions between arms and to the osmotic pressure created by the dissociated counterions.



Star polymers, bloc copolymer micelles, polymer-coated colloids



Typical scattering functions

In this communication, we present an original structural study on well-defined star-branched PEs in salt-free aqueous solutions (NaPSS, 12 arms) using Small Angle Neutron Scattering[3]. Scattering functions exhibits two maxima that are distinct in nature. The first is related to a position order between star cores. The second is associated to a correlation hole of electrostatic character between arms. Their variation in concentration provides a unique way to determine the critical overlap concentration and the geometrical radius of the stars *R*. By considering stars of identical functionality but with different degree of polymerisation per arm *N*, we find *R* scaling linearly with *N*, suggesting an elongated average conformation of the arms. The general organisation of PE stars, as well as their arm properties will be presented and compared to that of linear PE solutions.

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