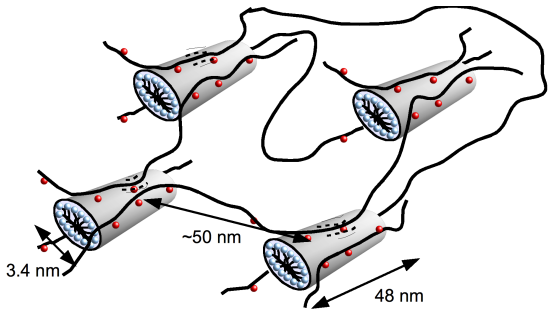
Understanding Viscosity Changes in Oppositely Charged Biopoly-electrolyte - Surfactant Complexes

Oppositely charged Polyelectrolyte- Surfactant Complexes (OPSCs) have attracted much interest over the past decades. Not last because of their relevance in numerous household applications such as detergency and paints, or as rheological modifiers. Depending on their exact composition and chemical nature some of these OPSCs can greatly increase the viscosity of aqueous solutions upon addition of relatively small amounts of material on the order of 1 wt%, while others have only very little effect.



This project will focus on elucidating the underlying mechanisms responsible for the increase in viscosity and their structural prerequisites. This will be achieved by combining neutron scattering experiments and molecular dynamics simulations. While small angle neutron scattering (SANS) will be used to determine the mesoscopic structure of the solutions, neutron spin-echo spectroscopy (NSE) will be applied to study their dynamics. The starting point of the project will be the previously studied system JR 400/SDS which is known to form large network structures. JR 400 is a cationically modified hydroxyethyl cellulose while sodium dodecyl sulphate is one of the most abundantly used surfactants and their mixtures can change the viscosity of a semi dilute aqueous solution over four orders of magnitude The samples under investigation will be custom made surfactants and polyelectrolytes, allowing to systematically vary different parameters of the s ystems. The experimental work will be accompanied by molecular dynamics simulations taking advantage of the umbrella sampling method.

Combining the results from experimental work and simulations will allow for a comprehensive understanding of the mechanisms involved in the modification of rheological properties in some of these mixtures and the lack of such effects in others.