

A tribute to Isabelle Grillo



Contribution ID: 76

Type: **Invited speaker**

Polymer - Surfactant complexes

Friday, 20 May 2022 11:30 (30 minutes)

Polyelectrolytes (PEs) are polymers with ionisable groups that dissociate in water. This water-solubility is a remarkable property commonly used in industrial formulations (thickener, gel...). The presence of electrical charges opens up additional possibilities through the formation of electrostatic complexes with oppositely charged species (colloids, surfactants, PEs, proteins...) leading to new potential applications (flocculent, drug delivery, chemosensors, coatings...).

The structure of these complexes results from a subtle balance between hydrophilic, hydrophobic and ionic interactions but also depends on the intrinsic stiffness of the polymers and the shape of the oppositely charged assemblies [1]. The organisation of the complexes is a fundamental point to control in order to improve applications. That concerns the average conformation and the dispersion state of the polyions, but also, the organization of the oppositely charged species. In this context, small angle neutron scattering (SANS) combined with isotopic substitution and contrast variation is the best technique since it allows to determine the partial structure functions of the different components and the form factor of the polyions in the dilute or semidilute regimes.

In this presentation, we focus on PEs / oppositely charged surfactant systems. The complexation can lead to different organisations according to the properties of the different constituents [2]. We considered mixtures of sodium sulfonated polystyrene (PSSNa, highly charged flexible PE) and oppositely charged dodecyltrimethylammonium bromide surfactants (DOTAB). Experiments were performed on D33 (ILL) in the semidilute regime for different surfactant concentrations. Solution of hydrogenated surfactants and hydrogenated or deuterated polyions in H₂O/D₂O were used to reveal the different structure functions.

The organisation of the PSSNa/DOTAB complexes will be presented and discussed in the light of the monomer and surfactant partial structure functions as well as the form factor of the polyions.

1. J. C.T. Kwak, Polymer-Surfactant Systems Marcel Dekker, Inc 1998
2. L. Chiappisi, I. Hoffmann, M. Gradzielski, Soft Matter, 2013, 9, 3896

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Session Classification: Talks