Bilayers at the ILL

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Quaternized chitosan oriented surfactant self-assembly complexes

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PolyElectrolyte-Surfactant Complexes (PESCs) are interesting colloidal systems characterized by a complex, mesoscopically ordered inter- and intra-particle structure. Depending on their composition such assemblies are often sensitive to environmental stimuli, e.g. T and pH. One building block of such a potentially functional material can be the naturally derived polycation chitosan and the oppositely charged biofriendly surfactant alkylethoxy carboxylate, which were studied in our group previously [1, 2]. Here one has the nm-sized structures formed by the surfactant molecules and the larger sized structures controlled by the longer length scale of the polymer chains. This system has potential for applications in various fields, e.g. cosmetic and pharmaceutical formulations or in detergency, especially as it shows marked pH-dependent behaviour. Previous results showed that the local PESCs structure depends substantially on the surfactants packing parameter and their interactions. By admixing the oppositely charged macromolecule unilamellar vesicles formed by C12E4COO are transformed to multilamellar vesicles (MLVs). However, with normal chitosan the working pH range was limited to below pH 6. By quaternizing the chitosan by methylation with up to 100% permanent charges the working pH range was successfully extended to the full pH range of acidic via neutral to basic. The ionically assembled structures for different types of surfactants and different quaternized chitosan were investigated as a function of the mixing ratio with different methods e.g. turbidity, light scattering, and small-angle neutron scattering (SANS) in order to cover the complete relevant size range of 1-500 nm for a broad range of composition. Different tunable bilayer structures were observed and one has as structural tuning parameters the molecular structure of the surfactant, pH (controlling the charge on the surfactant aggregates) and the mixing ratio of the surfactant and modified chitosan.

1. Chiappisi L.; et al. *Langmuir*, **2014**, 30(7), 1778-1787.
2. Chiappisi L.; et al. *Langmuir*, **2014**, 30(35), 10608-10616.

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