

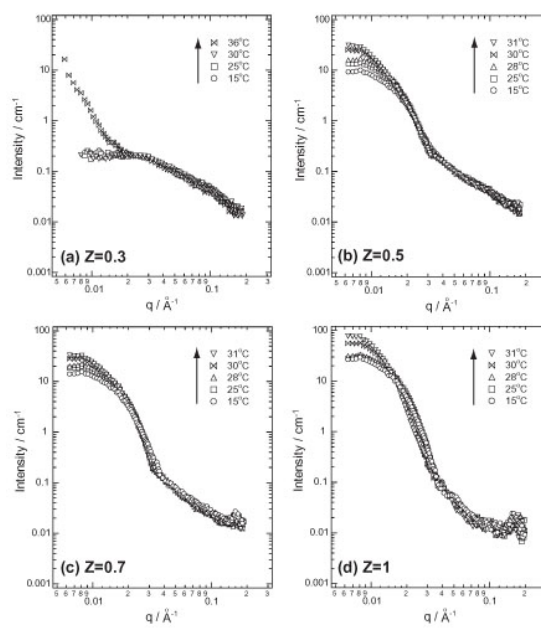
# Colloidal Complexes obtained from Charged Diblock Copolymer and Oppositely Charged Surfactant

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During the past decade, there has been a widespread interest for the design and synthesis of polymer-based colloidal particles of high stability in aqueous solutions. Among these particles, colloidal complexes have emerged as a new type of microstructure with potential applications in drug delivery. The block copolymer is the key feature of the electrostatic self-assembly. The overall size and the stability of the colloid depend on the nature of the electrostatic charges, on the molecular weight, and on the flexibility of the chains.

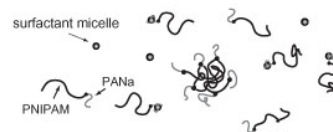
We report on the formation colloidal complexes resulting from the electrostatic self-assembly of polyelectrolyte-neutral diblock copolymers and oppositely charged surfactant. In the diblock/surfactant system, the polyelectrolyte block is negatively charged poly(sodium acrylate) and the neutral block is poly(N-isopropylacrylamide). The copolymer is studied in aqueous solution in the presence of cationic surfactant dodecyltrimethylammonium bromide (DTAB). Using light and neutron scattering experiments, and fluorescence spectroscopy, the diblock copolymer associate with oppositely charged surfactant into colloidal complex that have core-shell microstructure. For surfactant/polymer charge ratio  $Z$  lower than a threshold ( $Z_c \sim 0.4$ ), the complexes are single DTAB micelle attached by few copolymers. Above the threshold, the formation of hierarchical core-shell structure takes place. The core of typical radius 15-17 nm is composed of densely packed surfactant micelles connected to polyelectrolyte blocks. The corona of the colloidal complex is constituted from poly(N-isopropylacrylamide). Typical hydrodynamic radius of the complex is around 30 nm. Due to the LCST-type thermosensitive property of poly(N-

isopropylacrylamide) corona, the complexes form larger aggregates with the hydrodynamic sizes  $\sim 300$  nm. We have also investigated the colloidal stability under the different degree of neutralization and the presence of salt.



(a)  $Z < Z_c$

Unimer, surfactant micelle, aggregated polymer, and DTA micelles decorated by one polymer



(b)  $Z_c < Z$

Colloidal complexes obtained from charged polymers and DTAB

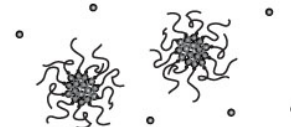


Fig. 1. SANS profiles for 0.4wt% PNIPAM-b-PANa/DTAB in D2O at various temperature and schematic illustrations of complexes.