

Effects of Bile Salt Sodium Glycodeoxycholate on the Self-Assembly of PEO-PPO-PEO Triblock Copolymer P123 in Aqueous Solution.

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Pluronics which belong to the family of nonionic triblock copolymers are composed of poly(ethylene oxide) (PEO) and poly(propylene oxide) (PPO) blocks. Due to their tunable phase behavior in aqueous solutions, biocompatibility and non-toxicity, they have been widely used in biomedical applications.¹⁻³ Present work explores the influence of a natural body surfactant, sodium glycodeoxycholate (NaGDC) on the association behavior of P123 (EO₂₀PO₆₈EO₂₀) in aqueous solution which in turn can be a backbone for probing the possibility of pluronics applications in the therapy of bile acid diarrhea and hypercholesterolemia diseases. The investigation of the P123/NaGDC system has been accomplished by means of dynamic and static light scattering (DLS/SLS), small angle X-ray and neutron scattering (SAXS/SANS), electrophoretic mobility measurements and differential scanning calorimetry (DSC).⁴ The experiments were performed on mixed solutions at a constant P123 concentration of 1 wt % and varying bile salt concentrations up to a molar ratio, MR=144 ($MR = n_{\text{NaGDC}}/n_{\text{P123}}$). In the case of MR=0 and at 40 °C, P123 unimers are in the form of spherical core-shell micelles. The PPO blocks form the micelle core while the PEO blocks occupy the corona. The DSC measurements demonstrated that, at high NaGDC concentration, NaGDC disintegrated the micelles causing the critical micelle temperature (CMT) of P123 to shift toward higher temperatures on the same time as the transition enthalpy decreased (Figure 1).

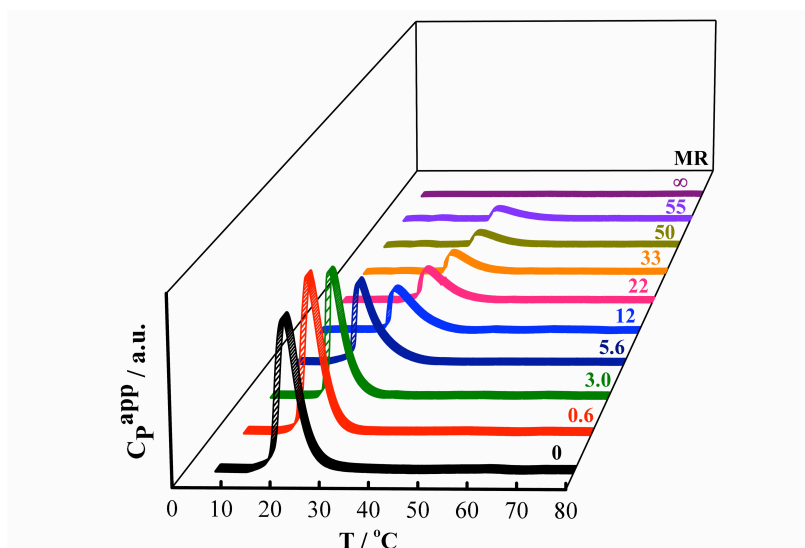


Figure 1. DSC of P123/NaGDC mixtures at different molar ratios MR.

Three different concentration regimes, low ($MR \leq 0.6$), intermediate ($0.6 < MR \leq 12$) and high ($MR > 12$), were perceived in both the DLS and SLS measurements where the composition of particles in the solution changed from the negatively charged P123 micelle-NaGDC complexes to the small NaGDC-P123 complexes that resembled bile salt micelles. The repulsive interaction between P123 micelle-NaGDC complexes were confirmed by SAXS and SANS experiments in addition to that the bile salt monomers were located in the PEO corona of the complexes

References

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