

Physicochemical Studies of Nonionic Surfactants, C₁₂E₁₂ and C₁₂E₁₅ : Effect of pH and NaCl

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Abstract - Aqueous micellar solutions of nonionic n-dodecyloligo ethyleneoxide surfactants, dodeca and pentadeca oxyethylene n-dodecylether, C₁₂ and C₁₂E₁₅ [CH₃ (CH₂)₁₀ CH₂ (OCH₂ E₁₂CH₂)_{12/15} OH] have been investigated at different pH (acidic to alkaline) and in the presence of NaCl at different temperatures. The interfacial and micellization properties have been studied from surface tension measurements using du Nouy tensiometer. The cmc shows maximum value at neutral pH. With increase in the concentration of NaCl and also with the increase of temperature (35–50°C), the cmc decreases. Apart from the thermodynamic quantities of micellization as well as adsorption at air/water interface, the heat capacity ($\Delta C_{p,m}$), transfer enthalpy ($\Delta H_{m,tr}$), transfer heat capacities ($\Delta C_{p,m,tr}$), and Traube (s) constant have been evaluated and discussed. Both micellization and adsorption processes have been found to be endothermic at all pH and in the presence of NaCl. An enthalpy-entropy compensation effect has been observed with an isostructural temperature from 299-315 K for both the micellization and interfacial adsorption processes. The CPs of C₁₂E₁₂ and C₁₂E₁₅ were significantly affected by the presence of NaCl but variation in pH does not have much C₁₂ effect. The micelle aggregation number (N_{agg}) has been measured by using steady state fluorescence quenching method at a total surfactant concentration ~ 10 mM at 30°C. The micropolarity and the binding constant (K_{sv}) for C₁₂E₁₂ and C₁₂E₁₅ in the presence of increasing concentration of NaCl (0.1, 0.25, 0.5, 0.75 and 1.0M) were determined from the ratio of the intensities of the first and the third vibronic peaks (I₁/I₃) of pyrene fluorescence emission spectrum. The micellar interiors were found to be reasonably polar.
