

Conductometric Study of the Interaction of Cetrimide with Sodium Dodecyl Sulfate in Aqueous Medium

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Abstract Synergistic interactions between cetrimide and sodium dodecyl sulfate (SDS) were studied at three different temperatures. Aqueous solutions of pure cetrimide, SDS and their mixtures were investigated conductometrically. The mixed surfactants exhibited nonideal behavior as the *CMC*s are less than the ideal *CMC* values calculated by using Clint's equation. In addition, Rubingh's model was used and various parameters such as the activity coefficients f_1 and f_2 , micellar mole fraction, X , interaction parameter, β , excess Gibbs energy and enthalpy of mixing, ΔG_{ex} and ΔH_{ex} , respectively, were calculated. The values of f_1 , f_2 , and β indicate strong interaction between cetrimide and SDS and the interaction increases with increasing mole fraction of SDS in the mixture. Negative β values and $|\beta| > |\ln(CMC_1/CMC_2)|$ clearly confirm synergism in the surfactant mixture. Negative ΔG_{ex} and ΔH_{ex} values of the mixed systems at different bulk mole fractions also reflect the behaviors of β and f . The values of the standard Gibbs energy and enthalpy of mixed micelle formation are negative, suggesting that micellization is thermodynamically favorable and exothermic in nature. Larger positive contributions of the entropic component, $T\Delta S_m^0$, than the enthalpic component, ΔH_m^0 , to ΔG_m^0 are ascribed to the destruction of the structured water surrounding the hydrophobic groups of the surfactants when these groups are transferred from the bulk into the interior of the micelle.

Keywords Cetrimide · Sodium dodecyl sulfate · Conductivity · Thermodynamics

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