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Thermodynamic Properties of N-Benzyl-N,N-dimethyldodecan-1-aminium bromide Sufractant in Binary Mixture of Propane-1,2-diol and Water

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Micellar systems are colloids with various applications in different branches of industry such as cosmetic, petrochemical, pharmaceutical or food industry. Micelles can be used as nanocarriers of poorly water-soluble substances. This property is often used for drug delivery in medical treatments. Micelle formation is a complex process where multiple interactions take place, but most important are hydrophobic interactions. Propane-1,2-diol (propylene glycol) is a chemical widely used as a food additive while N-Benzyl-N,N-dimethyldodecan-1-aminium (benzododecinium) bromide is quaternary ammonium salt used as preservative and antiseptic in pharmaceutical products. The latter is highly soluble in water and acts like cationic surfactant in aqueous solutions. The research outcome is as the weight percentage of propane-1,2-diol in mixtures increases, the values of critical micellar concentration increase. The negative value of ΔG^0_m show that micellization process is spontaneous. All values of ΔH_m^0 are negative and decrease with increasing precentage of glycol in the mixture. In mixtures zeta potential values decrease as a result of glycol effect to charge of micellar colloid. Result of that effect is collapse of micellar structure. From ^{1}H NMR experiment, upfield shifts of benzododecinium bromide peaks are not consistent with the increase of added propane-1,2-diol in comparison to pure benzododecinium bromide. The shift is caused by the interaction of the polar part of benzododecinium bromide with the alcohol, causing the shielding effect and consequently, the lower ppm values. With increase of weight percentage of propylene glycol caused the rapid increase in the integral value of the peaks corresponding to protons of propylene glycol, whereas the same properties cannot be attributed to benzododecinium bromide corresponding peaks.

Keywords: Thermodynamic, N-Benzyl-N,N-dimethyldodecan-1-aminium bromide, propane-1,2-diol, electrical conductivity, micelles

FULL TEXT