ABSTRACT PRESENTATION ON CONFERENCES

Physicochemical Investigations on the Aggregation Behavior of Double-Headed Anionic Surfactants in Combination with Hexadecyltrimethylammonium Bromide

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Interfacial and micellization behavior of cationic surfactant hetyltrimethylammoniumbromide (HTAB) have been studied systematically in combination with double headed amino acid based anionic surfactants (disodium salt of N-dodecyl-amino-malonate, N-dodecyl aspartate, and N-dodecyl glutamate). Critical micelle concentration (CMC) values were determined by tensiometry, conductometry, UV-Vis absorption and emission spectroscopy. With increasing mole fraction of the anionic surfactants, CMC values gradually increased. Associative interactions were observed between the oppositely charged mixed surfactant systems. Dynamic light scattering (DLS) studies revealed the size enhancement with increasing the mole fraction of the anionic surfactants. Zeta potential values were negative dominated with contribution of the anionic surfactants. Sigmoidal variation in the polarity and fluorescence anisotropy values (using pyrene as a probe) with the composition was observed from which the CMC values could also be determined. Aggregation number of the mixed surfactant systems varied in non-systematic ways with the surfactant composition. Viscosity of the mixed micelles in aqueous medium for 20 to 40 mole% CTAB comprising systems were highly viscous; some of the combinations formed gels, and liquid crystals, as observed by polarized optical microscopy. Some of the mixed surfactant systems showed unusual shear viscosity (shear thickening, and increased viscosity with increasing temperature). Such mixed surfactant systems are considered to be promising in terms of gel based drug delivery or nanoparticle synthesis.

Investigations on the Gel Formed by Double-Headed Anionic Surfactants in Combination with Hexadecyltrimethylammonium Bromide

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Abstract:

Physicochemical characterization of the gels formed by three double-headed anionic surfactants (*N*-dodecyl derivatives of amino-malonate, $C_{12}MalNa_2$; aspartate, $C_{12}AspNa_2$; and glutamate, $C_{12}GluNa_2$; AASs) in combination with hexadecyltrimethylammonium bromide (HTAB) at different mole% (20, 40, 50, 60 and 80) have been studied by ternary phase diagram, polarization optical microscopy (POM), fluorescence microscopy (FM), scanning electronic microscopy (SEM), thermo-gravimetric analysis (TGA), differential scanning calorimetry (DSC) and rheological measurements. AAS-HTAB mixed systems exhibited different phases, *viz*., gel, and highly viscous, precipitate and clear fluid region. The carboxylate groups of AASs are separated by methylene group(s); thus while moving from $C_{12}MalNa_2$ - to $C_{12}AspNa_2$ to $C_{12}GluNa_2$ - percentage area of gel and highly viscous phases gradually decreased. The internal structure and the liquid crystalline behavior of gel and highly viscous systems were investigated by combined POM and FM. Porous and flower like surface morphologies were confirmed by SEM. The phase transitions along with the weight loss of different surfactant mixtures were found to be dependent on the surfactant combination. Thermotropic behaviors of the mixtures of surfactants were investigated by DSC studies. The enthalpy of transition from solid-to-liquid, crystal-to-isotropic liquid for the mixed surfactants increased systematically with increasing proportion of AAS. Gels comprising lower proportion of AAS (< 40%) were more viscous. Gels exhibited shear thinning with increasing temperature. Gels with higher proportion of AAS did not cause any significant irritation on mice skin, suggesting its possible application as topical drug delivery system. The surfactants mixtures were also found to exhibit pronounced antibacterial efficacy when administered with *Staphylococcus aureus*, one of the dominant causative agent for skin and soft tissue infections.