

**Investigating Synergism in Critical Micelle Concentration of
Anionic-Nonionic Surfactant Mixtures: Surface
Versus Interfacial Tension Techniques**

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Abstract: In this research, anionic (SDS) and nonionic (TX100) surfactant mixtures (1:2, 1:1, 2:1; TX100: SDS mass ratios) were evaluated for possible synergism in Critical Micelle Concentration (CMC). Synergism of both surfactants was sought in presence of shale and/or oil phase. The composition of mixed micelles and the interaction parameter, β evaluated from the CMC data obtained by both Surface Tension (ST) and Interfacial Tension (IFT) for different systems using Rubingh's theory were discussed. Both techniques give comparable conclusions regarding synergism in CMC. However, using IFTs to determine CMCs before and after equilibration with shale showed greater losses of nonionic surfactant than using ST technique. For the interfacial tension data, β -values ranges from -5.803 to -5.917 before equilibration with shale and from -1.286 to -2.045 after equilibration with shale for the mixtures with TX100 mole fractions of 0.18 and 0.47, respectively. This result suggested that synergism was always stronger before equilibration with shale and/or contact with oil phase. Among the mixtures studied, the mixture with higher TX100 mole ratio exhibit more synergism than others. This is particularly true after equilibration with shale and/or contact with oil phase pointing out to the role, the losses of TX100 may have on synergism of TX100-SDS mixtures.

Key words: Surfactant, CMC, adsorption, partition, mixed surfactants

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