CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Mixtures of an anionic and a cationic surfactant, SDS-DTAB, SDS-CTAB and SDS- DTDACl, were studied for the precipitation phase boundaries in the aqueous solution without electrolyte. It was found that using different tail length surfactants, SDS-CTAB and SDS- DTDACl system reduced the tendency to precipitate when compared with using similar tail length, SDS-DTAB system. The CMCs of the anionic-cationic surfactant mixtures are lower than using single pure surfactant. The precipitation phase diagram of SDS-DPCl without NaCl was also compared with the 0.15 M of NaCl system. The absence of electrolyte system showed the broader precipitation phase diagram than the system with 0.15 M of NaCl.

Microemulsion formation by mixed surfactants was investigated to study the effect of surfactant structures. The anionic-cationic surfactant mixtures were SDS-DTAB, SDS-CTAB, SDS-DDAB, SDS-DTDACl, DTAB-AOT, DTAB-AMA, DTAB-AAY, and DTAB-Dowfax8390. All these systems were carried out at 0.05 M total surfactant concentration and 0.15 M NaCl, and were stabilized in equal volume of water and hexane at 25°C. The surface activities, interfacial tension and solubilization parameter, were determined as a function of the cationic surfactant mole fraction. It was determined that attractive interactions in mixture of cationic and anionic surfactants are governed chiefly by the surfactant tail lengths. First, if both tails are of single-tail surfactants (e.g., SDS-DTAB and SDS-CTAB), strong attractive interactions occur, leading to precipitation of surfactants at the equimolar composition and the formation of alcohol-free middle phase microemulsion at the concentration close to the equimolar. Second, if there is one long and one very long double-tail (e.g., SDS-DDAB and SDS-DTDACl), the greater potential for the mixture was observed at the high cationic surfactant fraction. Third, if there is one long and one short double- tail (e.g., DTAB-AAY). the middle phase microemulsion was occurred and the low interfacial tensions exhibited in a wide range of cationic surfactant ratio. Moreover, if there is one monovalent cationic surfactant and one divalent anionic surfactant (e.g., DTAB-Dowfax8390), the middle phase microemulsion was formed at the mixture 2:1 cationic/anionic surfactant as hypothesized.

The microemulsion formation of DTAB-AAY was also investigated in different hydrophobicity oils. Three oil representatives are TCE, hexane, and hexadecane, which are arranged in order of EACN values. As the oil EACN increases, the mixed ratio of anionic-cationic surfactant mixture for the tendency to form middle phase microemulsion will approach 1:1 for monovalent cationic/ anionic surfactants.

5.2 Recommendations

All these mixed surfactants should be determined in a wide range hydrophobicity of oils. The use of these anionic-cationic surfactant mixtures should be further evaluated in the industrial applications and consumer products.