CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

In this thesis, we studied the adsorption of both single surfactant and a binary system of cationic surfactant (CTAB) and nonionic surfactant (Triton X-100) at different molar ratio 1:1, 3:1 and 1:3 on precipitated silica. We then examined the adsolubilization of two organic solutes, toluene and acetophenone, into the adsorbed surfactant aggregates. The results indicate that the addition of Triton X-100 to CTAB system has significant effect on both surfactant adsorption and adsolubilization of organic solutes. For the surfactant adsorption, the presence of nonionic surfactant has shown to influence both adsorbed amount and CMC of the mixed surfactant system. As expected, CTAB adsorbs preferentially on precipitated silica as shown by the highest adsorbed amount per gram of silica whereas Triton X-100 adsorbs the least. The presence of Triton X-100 in the mixed surfactant system causes lowered adsorbed amount of surfactant as well as a reduction of CMC of the mixed surfactant system when compared to the pure CTAB system. This can be explained as the ionic head groups are separated from each other by the nonionic surfactant head groups, thus resulting in the reduction in electrostatic repulsion of the head groups.

From the adsolubilization studies in the single-solute systems, the adsolubilization of toluene seems to be directly related to the amount of surfactant adsorbed on silica surface for both single- and mixed-surfactant systems. On the other hand, it is interesting to find that the synergistic effect is clearly observed in the adsolubilization of acetophenone in some of the mixed CTAB/Triton systems, which is probably due to the presence of the EO group of the nonionic surfactant in the mixed-surfactant admicelles. The partition coefficient (K) obtained from the adsolubilization data denotes that toluene is adsolubilized in both core and palisade regions whereas the adsolubilization of acetophenone is primarily in the palisade region. This is attributed to the difference in the polarities of the two solutes.

In the mixed-solute systems, the adsolubilization of toluene is slightly higher in the presence of added acetophenone for both single- and mixed-surfactant system. A possible explanation is that acetophenone present in the admicelle may force out water molecules in the palisade region, making the interior of the admicelle become more nonpolar, and thus, more toluene can adsolubilize. In contrast, the synergistic effect is more pronounced in the case of acetophenone adsolubilization in co-solute system. The amount of adsolubilized acetophenone is significantly higher in the presence of toluene for both single- and mixed-surfactant systems. This may be attributed to the swelling of the admicelles due to the presence of toluene and the hydrophobic interactions between the two adsolubilizates.

5.2 Recommendations

Upon the completion of this study, the adsolubilization of organic solutes into mixed surfactants adsorbed on precipitated silica have been examined. It is interesting to study the effect of pH and ionic strength on both mixed surfactant adsorption and adsolubilization. Moreover, the adsolubilization by admicelles of surfactant mixtures should be investigated in more details. In this aspect, it would be worthwhile to characterize the structure of surfactant mixtures adsorbed on silica or similar surfaces using relevant techniques such as scanning probe electron microscopy.