CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

In this study, we studied the adsorption of cationic surfactant, CTAB, and two nonionic surfactants, Triton X-165 and Triton X-305, on precipitated silica in the single- and mixed surfactant systems. We then examined the adsolubilization of two organic solutes, toluene and acetophenone, into the adsorbed surfactant aggregates in each surfactant system. From the adsorption studies in single-surfactant system, the results indicate that the adsorption of CTAB on Hi-Sil®255 silica is much higher than Triton X-165 and Triton X-305, respectively. This is attributed to the preferential adsorption via electrostatic interaction between CTAB and silica surface more than the hydrogen bonding between Triton X- and silica surface. For mixed-surfactant systems, the amount of surfactant adsorption on silica decreases with increasing molar ratio of Triton X- in the initial mixtures. In addition, the amounts of surfactant adsorption in both mixed-surfactant systems are found to be in between those of single-surfactant systems. The decrease in the adsorption of CTAB upon the addition of Triton X- is likely due to the competition between the bulky nonionic and CTAB. Comparing between the mixed-surfactant systems of CTAB/Triton X-165 and CTAB/Triton X-305, it can be seen that the surfactant adsorption in the mixed-surfactant systems of CTAB/Triton X-165 is much higher than the mixed-surfactant systems of CTAB/Triton X-305 for all 3 ratios. A possible explanation is that the repulsive interaction of hydrophilic heads between the already adsorbed molecules on the surface and the molecules that going into the interface can be expected to be stronger in the mixed CTAB/Triton X-305 than in the mixed CTAB/Triton X-165 systems.

From the adsolubilization studies, it can be seen that the adsolubilization of toluene in both single- and mixed- surfactant systems are found to depend on the amount of surfactant adsorbed on silica. Moreover, the amount of toluene adsolubilized in mixed-surfactant systems of CTAB/Triton X-165, which has shorter number of EO groups, is higher than the mixed-surfactant systems of CTAB/Triton

X-305 for all three ratios. This is attributed to the higher amount of surfactant adsorbed on silica in mixed CTAB/Triton X-165 systems than in mixed CTAB/Triton X-305 systems. The partition coefficient (K) obtained from the adsolubilization data indicates that toluene adsolubilize into both the palisade layer and the core of the admicelles.

In the acetophenone adsolubilization, it can be seen that the adsolubilization of acetophenone in both single- and mixed- systems is not proportional to the amount of surfactant adsorbed on silica as observed in the case of toluene. This is probably due to the preference of acetophenone adsolubilized in the layer of surfactant adsorbed. It is also noted that both mixed-surfactant systems provide synergistic behavior, especially the mixed-surfactant systems of CTAB/Triton X-305, which has higher number of EO groups provides synergistic behavior for all three ratios. The results clearly suggest that the incorporation of Triton X- into CTAB admicelles leads to synergistic behavior for the adsolubilization of acetophenone.

5.2 Recommendations

Upon the completion of this study, the adsorption of mixed surfactants and the adsolubilization of organic solutes into precipitated silica in a binary system of cationic-nonionic surfactants admicelles should be further studied at various pH. It would also very interesting to investigate the adsolubilization of other organic solutes, such as benzene or ethylbenzene.