CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

In this study, we studied the adsorption of cationic surfactant, CTAB, on precipitated silica at two pHs (5 and 8) and at three levels of adsorption corresponding to points in regions I, II, and III of the typical adsorption isotherm. We then examined the adsolubilization of two organic solutes, toluene and acetophenone, into the adsorbed surfactant aggregates at each of the different adsorption levels. The results indicate that the adsorption of CTAB on silica is strongly dependent upon pH. From the adsorption studies, it can be seen that CTAB adsorption on Hi-Sil 255 silica at pH 8 is higher than the adsorption at pH 5 at any CTAB equilibrium concentration. This is attributed to two main reasons. First, the surface of the silica is becoming more negatively charged the farther pH is from the point of zero charge (PZC) of the silica (between pH 2-3). Second, the repulsion between head group of cationic surfactant (CTAB) is reduced the Br^- anion as ionic strength increases.

From the adsolubilization studies in the single-solute systems, the adsolubilization of toluene and acetophenone are found to depend on the amount of CTAB adsorbed as well as the structural arrangement of CTAB on silica at different equilibrium concentrations corresponding to different adsorption regions. Low levels of adsorbed CTAB have a much stronger effect on the adsolubilization of solutes than increases at higher levels of adsorption. The partition coefficient (K) obtained from the adsolubilization data indicates that acetophenone is mostly adsolubilized in the palisade regions, while toluene adsolublization occurs in both core and palisade regions. This is expected due to the difference in the polarities of the two solutes. Similar results were also observed in our previous study.

In the mixed–solute systems, the adsolubilization of toluene in the presence of added acetophenone is almost the same with the single solute system except at region III of pH 8 the adsolubilization of toluene in the presence acetophenone is

slightly higher than the toluene adsolubilization in the single-solute 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 more nonpolar. It is interesting to find that the synergetic effect is clearly observed in the case of acetophenone adsolubilization in co-solute system, that is, in the presence of toluene. The amount of adsolubilized acetophenone in the presence of toluene is significantly higher than the single solute system for all levels of adsorbed CTAB and at both pH values. 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 precipitated silica with different surface adsorption and equilibrium concentrations should be further studied at various ionic strengths by using the cationic surfactant (CTAB) or another surfactant. It would also very interesting to investigate the adsolubilization behavior of mixed surfactant aggregates formed by a system of two surfactants, possibly cationic and nonionic surfactants.