CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

In this study, the adsorption isotherm of surfactant on plastics that have different hydrophobicity were investigated and correlated to the contact angle of surfactant solution on those plastics. Three surfactant used were sodium octylbenzene sulfonate (anionic surfactant), cetylpyridinium chloride (cationic surfactant), and Trition X-100 (nonionic surfactant). The plastics used for both adsorption and contact angle study were high density polyethylene (HDPE), polystyrene (PS), and polyethylene terephthalate (PET).

From the results, the conclusion can be drawn as following:

Adsorption and wetting of CPC

1. The effect of adding electrolyte on adsorption was more pronounced for CPC solution below CMC. In this region, the amount of CPC adsorption increased probably due to the reduction of electrostatic repulsion between the head group of adsorbed CPC molecules.

2. The presence of CPC in solution reduced the contact angle of water on plastic. CPC decreased not only the γ_{LV} but also γ_{SL}. The reduction in both interfacial tension resulted in lower value of contact angle.

3. γ_{SL} was found to be related to CPC concentration as γ_{SL} decreased with CPC concentration. Together with the adsorption isotherm, γ_{SL} was also found to be decrease with CPC adsorption on plastic.

4. γ_{SL} decreased with increasing NaCl concentration for the same surfactant equilibrium concentration since NaCl allowed more CPC to adsorb on the surface.

5. Polarity of plastics appeared to have effect on wettability of CPC. In case of PS and PET, the presence of NaCl hindered the ability to reduce the contact angle for CPC solution that has the same γ_{LV}. The possible reason is the difference in the nature of solid/liquid interface and liquid/air interface. This difference caused

CPC to adsorb in a different way at the interface. With this, the addition of NaCl did not effectively reduce γ_{SL} as effectively as γ_{LV}. This observation was not clearly observed for HDPE since HDPE surface could be considered as a strong hydrophobic surface which is similar to the nature of liquid/air interface.

Adsorption and wetting of NaOBS

1. The effect of adding electrolyte on NaOBS adsorption was similar to the adsorption of CPC; i.e. the NaOBS adsorption was increased with added NaCl and this effect was more pronounced below CMC.

2. Contact angle of NaOBS solution decreased with NaOBS concentration. As observed in case of CPC, the presence of NaCl resulted in better wetting for solutions that have the same NaOBS concentration.

3. γ_{SL} decreased with NaOBS concentration as well as NaOBS adsorption, as found in CPC case.

4. For the same NaOBS concentration, the addition of NaCl caused the same effect on γ_{SL}, as observed from CPC.

5. Contrary to CPC case, polarity of plastics had no effect on wettability of NaOBS. All NaOBS solutions that have the same γ_{LV} produced almost the same contact angle on the same type of plastic. The possible reason is the difference in the length of hydrophobic tail of CPC and NaOBS.

Adsorption and wetting of Triton X-100

1. Below CMC, the contact angle of Triton X-100 decreased with its concentration.

2. The contact angles on different plastics at the same surfactant concentration were in the same order as found from CPC and NaOB.

3. γ_{SL} decreased with Triton X-100 concentration and reached the plateau at the CMC.

5.2 Recommendations

1. The effect of the length of hydrophobic tail is recommended for further study. For moderate hydrophobic plastics (PS,PET), the amount of carbon atoms in the tail appeared to have significant effect on the wettability of surfactant solution under influence of NaCl.

2. The experiment should be done for more types of plastic to confirm the effect of hydrophobicity on wettability of surfactant solution.