



CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

5.1.1 The Cloud Point Determination

Unexpectedly, the some of the cloud point temperatures of these studied surfactants are not corresponded to the surfactant structure. This is probably caused by the distribution of ethylene oxide numbers. In addition, the impurity in the surfactants may affect the cloud point as well.

5.1.2 Effect of Cloud Point Temperature on the Cloud Point Extraction

Surfactants with higher cloud point temperature give lower coacervate phase fractional volume. Therefore, surfactant and toluene partition ratios are depressed when a higher cloud point surfactant is used. As a result, surfactant with low cloud point gives high removal proficiency.

5.1.3 Effect of Operating Temperature on the Cloud Point Extraction

When temperature is elevated, the coacervate phase fractional volume is decreased while the surfactant and toluene partition ratios are increased. Therefore, the extraction efficiency can be improved by raising the operating temperature.

5.1.4 Effect of APE and AE surfactants on the Cloud Point Extraction

In the CPE, toluene can be successfully extracted by using both APE and AE surfactants. However, the APE surfactants show higher extraction efficiency than AE surfactants.

5.1.5 Effect of Alkyl Chain Length on the Cloud Point Extraction

The experimental results show that the extraction performance decreases with the increasing of alkyl chain length. However, this information were

not as expected. This may be due to the variation of ethylene oxide numbers in the hydrophilic group.

5.1.6 Effect of Number of Ethylene Oxide Group on the Cloud Point Extraction

For both APE and AE surfactants, when the number of ethoxylate groups is increased, the coacervate phase fractional volume is increased whereas surfactant and toluene partition ratios are decreased. Hence, the extraction efficiency is increased with decreasing of ethylene oxide group.

5.2 Recommendations

In order to enhance the extraction efficiency, further study must be done. For instance, the effect of adding other types of surfactants to form a mixed surfactants system and the effect of adding electrolytes should be investigated. The CPE on other types of nonionic surfactants should be explored to find an appropriate surfactant as well.

In addition, the cloud point extractions are usually carried out in the batch experiments. Therefore, this technique should be further studied in the continuous system for the practical uses.

Moreover, the investigation of the surfactant recovery should be examined as well. For example, the removal of nonionic surfactant in the coacervate phase, which is contaminated with volatile organic compound, can be possibly accomplished by using vacuum stripping.