CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The main objective of this thesis is the investigation of surfactant aqueous-based using microemulsion as extraction process for vegetable oil in order to compare with the conventional extraction by hexane. Micoemulsion formation by using surfactant aqueous-based offers several advantages. Firstly it can reduce toxicity exposed to the atmosphere and human health due to the absence of organic solvents for extraction process release to atmosphere. In addition, this extraction process is safer than conventional process using hexane that considered as carcinogenic substance. Secondly, low energy requirements for total process due to the reversibility of this process. Lastly, it is worth both of economic and environmental point of views because of less energy consumption, use less toxicity chemical and less pollution emission and waste generation. In other words, the concept of this study aimed to propose the green chemistry or clean technology concept.

However, the complexity of microemulsion systems still have their limitations because it may lead to the appearance of new structures during the extraction process due to strong variation in diffusion rates in different components.

Hence, another objective of this thesis aimed to find the microemulsions system that maximizes moblization of palm kernel oil from their seeds as well as minimizing palm kernel oil solubilization in micelle. Moreover, the quality of extracted oil is also included in this work to compare with oil extracted by hexane. In addition to palm kernel oil, the quality of extracted soybean oil using the optimum condition from previous study for extraction was also studied in this work.

The results show that the quality of soybean oil was good in term less protein loss from their seed meal. In other words, this surfactant aqueous solution may need further study to reduce partition of extended surfactant that may cause emulsion in oil phase.

In case of palm kernel oil extraction, the surfactant aqueous-based for both of the mixed surfactant system; 0.1% Alfoterra145-5PO and 3% Comperlan KD and 0.1%

Alfoterra5-8PO and 3% Comperlan KD can achieve the ultra low interfacial tension. In addition, these systems have high extraction efficiency as well as good quality of oil when compared to hexane extraction in conventional process. However, for these two selected surfactant systems; mixed Comperlan KD with Alfoterra 145-5PO and Alforterra 5-8PO, the extraction efficiency are insignificantly different.

The optimum condition of extraction in this study by the surfactant aqueous-based system which yielded free palm kernel oil phase more than 85% were; grain size 35-65 mesh or 0.212-0.425 mm, 30 minutes contact time and 1 g of palm kernel load per 10 mL surfactant solution or 1:10 solid to liquid ratio at 10% NaCl for both mixed surfactant systems.

5.2 Recommendations

Surfactant aqueous- based for vegetable oil extraction are the new approach and lack of supporting information nowadays then it is important to study further in this area. The recommendations for further study are as follow.

1. More detail on effect of various types of anionic extended surfactant system for palm kernel oil extraction should be investigated such as the effect of the length PO group on extraction efficiency.
2. The parameters indicate the quality of extracted oil in re-use surfactant solution extraction should be determined such as fatty acid composition, water remaining in oil phase and surfactant remaining in water phase.
3. The parameters affected on the kinetic of the extraction process should be studied in more detail in order to determine the optimum condition in the dimensions of time and energy consumption.
4. "Pollution Prevention or P_2 Concept" for vegetable oil extraction process using surfactant aqueous-based for industrial process compared to conventional process should studied for all cases of economic, environmental and industrial point of view.