CHAPTER VII
CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

In this work, froth flotation was applied to remove emulsified oil from water as an alternative for wastewater treatment. From the previous work, Winsor type III microemulsion condition provides the maximum oil removal by froth flotation operation. The combination of Winsor type III concept and froth flotation operation was investigated more in this work. Since, there are several important characteristics in Winsor type III microemulsion region such as the formation of middle phase, and ultra-low interfacial tension, the synergism of the middle phase formation on oil removal efficiency in froth flotation was investigated in ortho-dichlorobenzene system. From the results, system having only excess oil and excess water phases from Winsor type III microemulsion provides a higher oil removal than system having excess water and middle phase does. Therefore, it indicates that most of oils removed from flotation column came from the excess oil phase rather than the middle phase. Interfacial tension which is another characteristic in Winsor type III microemulsion was elucidated as a parameter affecting oil removal efficiency in both ethylbenzene and diesel systems. The results from ethylbenzene and diesel systems indicate that the maximum oil removal does not always correspond to the minimum interfacial tension. However, a very high interfacial tension value yields a very low oil removal efficiency. Moreover, in both ethylbenzene and diesel studies, foamability and foam stability were found to be dominant factor governing the oil separation efficiency in froth flotation operation. Consequently, it can be concluded that both interfacial tension and foam characteristics influence the separation efficiency in froth flotation operation. To improve separation efficiency, process parameters of froth flotation operation such as air superficial velocity and equilibration condition were investigated. The air superficial velocity used in froth flotation operation has to be optimized to obtain the proper balance between the foam production rate and water back-entrainment rate in order to achieve the maximum oil separation efficiency. In ethylbenzene system, a short period of agitation time before solution was transferred to the flotation column yields the oil removal as high as an equilibrated system. In contrast, agitated diesel solution before being transferred to the

column was found to yield the lowest oil removal because foam formation and foam stability are extremely low.

7.2 Recommendations

In this research, froth flotation in batch mode of operation was investigated to understand mechanism of this technique. However, continuous mode of froth flotation operation should be investigated to apply this technique with real application. In addition, technique to improve foam characteristics should be elucidated in the future work because the foam characteristics play an important role in froth flotation operation.