CHAPTER VI

CONCLUSIONS AND RECOMMENDATION

6.1   Conclusions

In this work, mass transfer of Cu^{2+} from feed solution across the hollow fiber supported liquid membrane extractor to a kerosene solution of D2EHPA has been investigated. The conclusions of the results are following:

1.   The Mathematical model for both once-through mode operation and recycling mode operation are developed. The removal efficiency of the copper-ion was introduced to study the accuracy and validity of the modified membrane.

2.   The mass transfer model is present that considers possible mass transfer steps, including aqueous layer diffusion, interfacial chemical reaction, membrane diffusion and organic layer diffusion. The calculated removal efficiency of copper ion concentration in feed solution were in reasonable agreement with experimental data (% error and standard deviation are 10.21 and 12.41, respectively). This indicated that the transport of copper ions through the hollow fiber supported liquid membrane can be calculated on the basis of a good knowledge of liquid-liquid extraction and hydrodynamic of the apparatus.

3.   The parameters which effect on the removal efficiency of the copper-ion extraction in hollow fiber supported liquid membrane in once-through mode operation are listed as follow:

3.1   The pH in feed solution and the hydrogen ion concentration in stripping solution are key parameters, which effect on the removal efficiency of copper-

ion. It was found that the suitable pH in feed solution is more than 6 and the suitable hydrogen ion concentration in stripping is more than 0.1 mol/l.

    3.2 The removal efficiency of copper-ion directly varies with the concentration of D2EHPA.

    3.3 The removal efficiency of copper-ion inversely varies with the concentration of copper-ion in feed solution and volumetric flow rate of feed solution.

    From the simulation results, the optimal condition for copper-ion extraction with supported liquid membrane can be summarized as table 6.1

Table 6.1 Optimal condition for copper-ion extraction with supported liquid membrane for this research

Parameters	Optimal condition
pH in feed solution	6-7
concentration of Cu^{2+} in feed solution	<300 ppm
volumetric flow rate in feed solution	<500 ppm
concentration of H^+ in stripping solution	0.1 mol/l

    4. The parameters which effect on the removal efficiency of the copper-ion extraction in hollow fiber supported liquid membrane in recycling mode operation are circulation flow rate of feed solution and recycle time. The removal efficiency of copper-ion directly varies with both recycle time and circulation flow rate of feed solution.

6.2 Recommendation

    Further work is necessary to study some parameters, which will be effect on the extraction. These parameters are the types of extractant and metal-ion, characteristics of hollow fiber module. The rate controlling step ought to determined.