

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

From the experimental results of this study, the following conclusions can be obtained :

1. The optimum condition for extraction of copper from aqueous solution is as follows.

It was demonstrated that more than 99% of copper could be separated from the external phase to the internal phase with one batch operation by using the optimum condition and thus the final copper concentration of the internal phase was twenty times as high as the initial concentration of the external phase. This represents a significant advantage for the liquid emulsion membrane process.

Table 7-1 The optimum conditions for extraction of copper 100 ppm. from aqueous solution by emulsion liquid membrane process.

Parameters	Optimum Condition
Initial pH in external phase	pH 3.0
Carrier (D2EHPA) concentration	10% (v/v)
Surfactant (Span 80) concentration	5% (v/v)
Internal phase concentration (HCl)	1.0 N
Emulsion phase to Feed ratio	1:9
Agitation Speed	400 rpm

2. From the experimental results on the continuous operation membrane extraction of copper in aqueous solution, it was found that emulsion liquid membrane can be used for extraction of copper from aqueous solution by used optimum conditions discovered in the batch

aqueous solution by used optimum conditions discovered in the batch operation emulsion liquid membrane. The result was 76.28% extraction of copper. And when the volumetric flow rate of feed solution decreased, the contacting time between feed solution and emulsion phase increased. Consequently, the extraction occurred better at lower volumetric flow rate.

3. The distribution coefficient (D^+) of Copper increases as the pH of the external solution increases.

4. From the extraction equilibrium, the results of the log-log between $[(HR)_2]_{eq}$ and $[D^+][H^+]^{m_{eq}}$ is a straight line with a slope of 2, and shows that one mole of Cu^{2+} under these conditions can be combined with two moles of the carrier D2EHPA.

5. The average K_{ex} for Copper is $8.20 \times 10^{-4} \text{ dm}^3/\text{mol}$.

Recommendations

1. From the emulsion liquid membrane on batch extraction study, it found that only some of the optimum conditions can be used for the continuous extraction of copper. Therefore, it should has the preliminary experiment before used these conditions.

2. If the process used multi-stages of extraction by used of the initial rate that the extraction significantly extracted (at first 10 minutes), it would be more advantage.

3. This study was conducted by using a surfactant (Span80) and a carrier (D2EHPA). Consequently, the future study might conduct by using several surfactants and several carrier to compare with this study. it will obtain the most appropriate condition for copper separation by emulsion liquid membrane.

4. This study was conducted by using copper solution model (copper salt dissolved in distilled water). Therefore, the future study might investigate by using real solution from industries.