CHAPTER I

INTRODUCTION

1.1 Background

Nowadays the increasing of the world population causes to the higher demand productions or recovery of metals. There are a lot of processes for recovery of metals such as solvent extraction, adsorption and chemical precipitation and solvent extraction is widely method. In this method compose of 3 phases of solution: feed phase, organic phase and stripping phase. A supported liquid membrane process is the solvent extraction process that combines the process of extraction, stripping and regeneration in to a single stage.

A supported liquid membrane has been recently recognized as a promising technology for separation or purification of toxic or valuable metal ions from aqueous stream. A typical supported liquid membrane consists of a polymeric (organic or inorganic) support impregnated or in contact with an extractant or carrier dissolved in an organic solvent and two aqueous solutions. The organic phase is immiscible with the aqueous media. Two common geometries for the supported liquid membranes are the flat sheet and the hollow fiber. In the supported liquid membrane, the forward extraction reaction occurs on the feed side and the reverse stripping reaction occurs on the stripping side.

The advantages of supported liquid membrane process over that the traditional solvent extraction processes are (Tavlarrides et al.1987):

1. low capital and operating costs,
2. low energy consumption,

3. economical use of expensive, tailor-made extractants and solvents because only an extremely small quantity of membrane liquid is required for filling the pores
4. low maintenance costs due to fewer moving parts,
5. possibility of achieving high overall separation factor.

The development of theoretical models, which account for the experimental results is fundamental for complete under standing of supported liquid membrane transport mechanism. Modeling allows one not only to explain but also to predict the behavior of a system under different experimental conditions when a set of relevant parameters are identified (concentration of the difference chemical species, forward and reverse rate constant, thickness of the membrane, diffusion coefficients of the species or mass transfer coefficients, etc.). Furthermore, mathematical modeling is essential to accurate scale-up the supported liquid membrane systems.

1.2 Research Objectives

The objectives of this research are:

1. To determine the mathematical models of supported liquid membrane for copper extraction,
2. To compare the experimental data with the model prediction,
3. To study the effect of parameters to copper-ion extraction.

1.3 Scope of Research

The scope of this research can be listed as follows:

1. Only the single stage hollow fiber liquid membrane is applied.
2. A carrier agent is bis(2-ethylhexyl) phosphoric acid (D2EHPA).
3. Matlab is used to simulate the mathematical model.

1.4 Contributions of Research

The expected contributions of this research can be listed as follows:

1. The mechanism of mass transfer, the reaction mechanism and the effect of parameter to the copper extraction have been studied.
2. The mathematical models can be extended to other metals.
3. The mathematical models have predicted the performances of the copper extraction.

1.5 Procedure Plans

1. The information of the supported liquid membrane process are reviewed and studied.
2. The mathematical models of copper extraction are determined.
3. The model predictions are compared with the experimental data.
4. The effects of parameters of copper extraction are studied.
5. The research data are summarized and the research conclusions are made.
6. The report is written.

This thesis is divided into six chapters.

Chapter I is an introduction to this research. This chapter consists of background, research objectives, scope of research, contributions of research and procedure plans.

Chapter II reviews the work carried out on hollow fiber supported liquid membrane.

Chapter III covers some background information of liquid membrane process (liquid membrane extraction process, types of liquid membrane and mechanism of mass transfer in liquid membrane).

Chapter IV proposes the mathematical model of a hollow fiber supported liquid membrane and experimental procedure.

Chapter V presents the results and discussion of this research.

Chapter VI presents the conclusions of this research and makes the recommendations for future work.

This is follow by:

References

Appendix A: Mass transfer coefficient determination,
Appendix B: The properties of copper,
Appendix C: Least squares method,
Appendix D: FSOLVE toolbox,
Appendix E: Simulation data