CHAPTER 1

INTRODUCTION

The application of biotechnology has much progressed in recent years, increasing the demand for biological products. Most conventional separation processes take advantage of only one difference in physical and chemical properties (e.g., electrostatic change, hydrophobicity, molecular size, solubility, etc.). As the need for higher degree of purification becomes widespread, it has become important to develop new separation techniques which takes advantage of two or more properties at the same time or separation techniques which have special selectivity. Emulsion liquid membrane are among such new separation technique.

Emulsion liquid membranes were first developed by Li in 1968 and many studies using emulsion liquid membranes have been carried out for the separation of heavy metals, phenols and organic acids. Recently, the application of emulsion liquid membranes in bioseparations and biomedical have become widespread (Thien&Hatton, 1987). Emulsion liquid membranes have great potential for applications in biotechnology and for recovery from fermentation products. Emulsion liquid membrane system consists of three phases (water/oil/water), where the oil phase acts like a membrane between the internal aqueous phase and the external

aqueous phase. The external phase is the feed solution and the extracted products should end up in the internal phase.

During, the formation of an emulsion liquid membrane, the internal phase is emulsified under high shear into the solvent. Typically, the resulting emulsion has a mean internal phase droplet diameter of 1-10 μm; it is stabilized by the addition of a surfactant to the organic phase. After emulsification, the emulsion is dispersed into the external phase under mild agitation, forming a dispersion of globules of 0.1-2.0 mm in diameter. The size depends on the physical properties of the external and membrane phases and the agitation speed.

Different solutes have different solubilities and diffusion coefficients in the membrane, and these properties can be further modified by the addition of a selective carrier, such as a tertiary amine or crown ether, to the solvent. Extraction involves the contraction between the dispersed phase and the external(feed) phase; after sufficient contact time the desired solute is recovered by emulsion breakage and release of the internal phase.

The main advantages of the emulsion liquid membrane extraction process are:

1. Very fast transfer rates because of the high specific surface areas.
2. Extraction and stripping in one stage, so that the product can be separated and concentrated at the same time.
3. The possibility of extraction from very dilute solutions.
4. Low energy consumption and minimal downstream unit operations.

One disadvantage of the system is swelling due to water transport from the external to the internal phase, resulting in a decrease in the degree of concentration of the solute achieved inside the membrane.

Amino acids are the main components of proteins which are found in all living organisms and play important roles in living cells. There are ten amino acids that are essential for existence and must be ingested through food, which are called "essential amino acids". Normally, livestock are unable to synthesize this amino acid, it must be added to these foodstuffs to provide an adequate diet. Animal feeds such as grain and defatted oil seeds contain only small quantities of L-lysine which is insufficient for animal metabolism because L-lysine is the most important amino acid for livestock. Thus, L-lysine is a substance of considerable economic importance.

The improvement of the separation process is one method to increase L-lysine productivity and emulsion liquid membrane should be one of the separation processes that can be use for extraction of L-lysine so this study will be focused on the extraction of L-lysine by emulsion liquid membranes process.

Objectives

The aim of this work is to explore the possibility to extraction of L-lysine from aqueous solutions by applying an emulsion liquid membrane process and find the optimum condition for improving the extraction of L-lysine using emulsion liquid membranes according to the following objectives:

1. To study the extraction of L-lysine from aqueous solution by emulsion liquid membrane process.
2. To study the variables that effect the extraction of L-lysine from aqueous solutions by an emulsion liquid membrane process.
3. To study the optimum conditions for the extraction of L-lysine from aqueous solutions.

Scope of the study

The extraction of L-lysine from aqueous solutions by on emulsion liquid membrane process was studied according to the following conditions:

1. The acidities (pH) of the external phase solution were 2, 3, 4, 5 and 6.
2. The concentrations of L-lysine in the external phase were 1, 5, 10, 50 and 100 mM.
3. The concentrations of surfactant (Span 80) were 1, 3, 5, 7 and 10 V/V%.
4. The concentrations of carrier (D2EHPA) were 3,5,7,10 and 15 V/V%.
5. The agitation speeds of the extraction equipment were 240, 300, 360, 420 and 480 rpm.
6. The concentrations of Hydrochloric acid in the internal phase were 0.5, 1.0, 2.0 and 3.0 N.
7. The extraction temperature used was 25 ^{o}C.