CHAPTER V

CONCLUSION AND RECOMMENDATION

Concerning the results from the experiments, the following conclusions can be derived.

1. The HFSLM process could be used in extracting and stripping cobalt with low concentration, that is more than 50% of cobaltous ions were extracted and recovered. Furthermore, the lower the concentration, the higher the extraction factor and the recovery factor.

2. Due to the extraction reaction with the acidic D2EHPA, the pH of feed solutions should be as high as possible. However, in case of cobalt, the pH of feed solution did not exceed 7.0 because of the formation of cobalt hydroxide. Moreover, the higher the pH (6–7), the more the precipitate which makes the operation impossible for HFSLM owning to very high inlet pressure and pressure drop. In addition, the oscillation of inlet pressure occurs according to the membrane clogging.

3. The oxalic acid solution could not be employed as a strip solution for the extraction of cobalt using D2EHPA as an extractant in a hollow fiber module. This is because the module is clogged up with the crystalline cobalt oxalate at the pore mouths of the strip channel. To put it in another way, an acid which forms the crystalline cobalt salt with cobalt cannot be used as a strip solution in hollow fiber supported liquid membrane processes.

4. The concentration of hydronium ion in strip solution almost had no effect on membrane permeability since the concentration, as much as used in the experiments, changed very little. Moreover, the circulation of strip solution during the operation has no effects on membrane permeability.

5. For the extraction of cobalt by the HFSLM process with D2EHPA as an extractant, the mode of operation should be once-through mode. Moreover, since the pH of raffinate drops drastically, its pH must be adjusted by adding some amount of basic solution in order to be used as feed solution for the next circulation.

6. Since the amount of cobalt extracted and recovered increased as the flowrate increased, the flowrate of both feed and strip solutions should be high; that is 1,000 ml/min for this system. This is because the pH of feed solution dropped drastically at the beginning of the module, the reaction hardly occurred in the remained part of the module. Therefore it is no use letting the raffinate remain in the module.

7. The amount of cobalt extracted and recovered also increased as the amount of extractant increased. For this system, the concentration of D2EHPA was 25 V/V%.

8. The organic solvent as well as the extractant used had to be insoluble in both of the mobile phases in order to increase the lifetime of liquid membrane. However, if the partially miscible organic solvent were used, both the mobile phases would be presaturated with the organic solution used. From the experiments, the organic solvent should be n-dodecane.

Recommendation

1. The effects of other metal ions in feed solution, especially nickel ion, can be studied further. In other words, the separation of multi-component dissolved in feed solution can be investigated by employing this system.

2. A multi-stage operation with multi-column can be applied to this system.