CHAPTER V
CONCLUSIONS AND RECOMMENDATION

5.1 Conclusions

Experiments were conducted to investigate the effect of the competitive removal of ions by Dowex50-8X resin. The results indicated the following:

1. The total capacity of the Dowex50-8X resin used in this work is 1.13 meq/ml.

2. The higher flow rate of the feed solution results in equilibrium being reached more quickly.

3. The exchange rate of hydrogen ions on the resin for the mixed-ions in the solutions carried out in the batch operation is higher than that in the column operation. This is because the batch operation has a more complete mixing rate. Hence, film diffusion plays very little effect on the adsorption.

4. The exchange rate of the single ion, namely, Ca^{2+} for H^+ on the resin was higher than that of Mg^{2+}. Also in the mixed-ion solution of Ca^{2+} and Mg^{2+}, the exchange rate of Ca^{2+} for H^+ on the resin was higher than that of Mg^{2+}. This is because of the higher atomic number of Ca^{2+}. Hence, the exchange rate depends on the particular cation being adsorbed.

5. In the single adsorption, the exchanger adsorbs Ca^{2+} more readily than Mg^{2+}. However, in the mixed-ion solution of Ca^{2+} and Mg^{2+}, the exchanger is almost equally favorable to Ca^{2+} and Mg^{2+}. Accordingly, the exchanger has a little effect on the equilibrium (k_2) for the mixed-ion solution of Ca^{2+} and Mg^{2+}.

6. The predicted rate of exchange in order to describe the experimental data can be explained in the following equation.

$$\frac{dq}{dt} = k_1 \left[\frac{q_t}{1 + \dfrac{h}{k_2 c}} - q \right]$$

7. The no-adsorption experiment was used to determine the behavior of the flow in the column. It was found that this system exhibited a good fluidized-bed pattern that can be represented by one CSTR and one PFR in series.

6. By combining the results from the response time experiment, adsorption batch experiment, and no adsorption column experiment, the model for the ion exchange in fluidized-bed column was developed.

5.2 Recommendation

The fixed-bed operation should be investigated as it is another operation that is widely used in industries. The capability of the developed model in representing the fixed-bed operation deserves some attention, as well.