

# Selective Recovery of Lithium from Aqueous Solution by Spinel-type Manganese Oxide Adsorbent

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## INTRODUCTION

Lithium manganese oxides have become one of very important electrode materials in rechargeable lithium batteries. The insertion - extraction process for lithium has received much attention in recent years. In this work, we report the selective recovery of lithium from aqueous solution by adsorption technique. The effects of eluent type, concentration and operating temperature on lithium recovery and manganese dissolution are studied.

## EXPERIMENTAL

Spinel-type  $\text{LiMn}_2\text{O}_4$  powder was synthesized by solid-state reaction of  $\text{MnCO}_3$  and  $\text{Li}_2\text{CO}_3$ . The  $\text{LiMn}_2\text{O}_4$  powder was eluted by 0.5N HCl solution to obtain  $\lambda\text{-MnO}_2$  adsorbent. After adsorption, lithium extraction process was carried out in a temperature-controlled shaker. The weight of adsorbent was 0.1 g, and the eluent volume was 200 ml. In the experiment, the concentrations of Li and Mn ions were measured with the atomic absorption spectrophotometer. Besides, SEM, XRD and BET analyses were employed to characterize the adsorbents.

## RESULTS AND DISCUSSION

As shown in Figure 1, lithium is extracted completely with any eluent within 48 h. About 18-20 % of Mn ions are dissolved when  $\text{HNO}_3$  or HCl is used as eluent. The eluent,  $(\text{NH}_4)_2\text{S}_2\text{O}_8$ , shows the least Mn dissolution (about 1%). Figure 2 indicates that the lithium recovery increases with increasing the eluent concentration. However, the increase in lithium recovery is not significant as the eluent concentration is over 0.25 M.

## CONCLUSION

Due to high Li recovery and low Mn dissolution,  $(\text{NH}_4)_2\text{S}_2\text{O}_8$  is concluded as a promising eluent for the lithium extraction from spinel adsorbents.

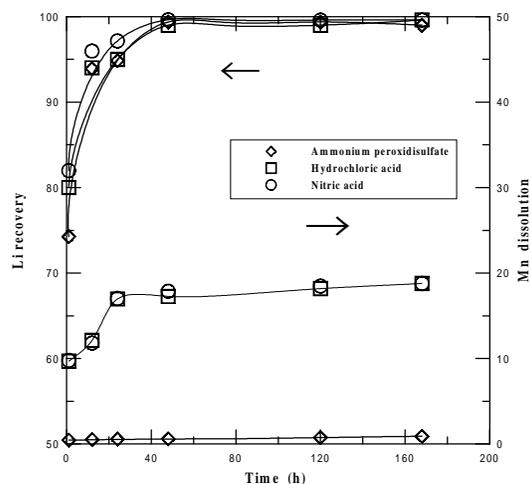


Figure 1 Relationships of Li recovery and Mn dissolution versus elution time. (Eluent Conc.: 0.25 M, Temp.: 25 °C).

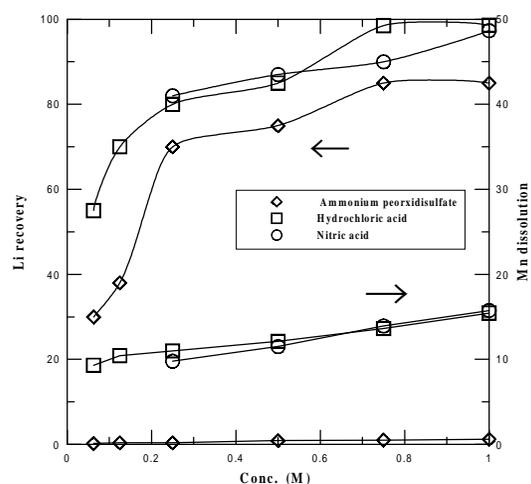


Figure 2 Effect of eluent concentration on Li recovery and Mn dissolution. (Temp.: 25 °C, Elution time: 10 h).