

## **Investigation of Lithium Transport through the $\text{LiMn}_2\text{O}_4$ Film Electrode Being Surface-Modified with $\text{LiCoO}_2$**

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박막 전극 내로의 리튬 이동 현상에 대한 연구

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Lithium transport through the  $\text{LiMn}_2\text{O}_4$  film electrode being surface-modified with  $\text{LiCoO}_2$  was investigated in a 1 M  $\text{LiClO}_4$ -PC solution by analyses of the potentiostatic current transient and ac-impedance spectra. For this purpose,  $\text{LiCoO}_2$  was deposited on the  $\text{LiMn}_2\text{O}_4/\text{Pt}/\text{Al}_2\text{O}_3$ -film electrode by rf magnetron sputtering method, and then annealed at 750 °C for 4 h in air. From the analysis of the anodic current transient, it was suggested that lithium transport through the surface-modified  $\text{LiMn}_2\text{O}_4$  film electrode proceeds by the same mechanism involving the cell-impedance-controlled constraint, as does lithium transport through the bare  $\text{LiMn}_2\text{O}_4$  film electrode. In addition, it was recognised that the cell-impedance-controlled constraint at the electrode surface is changed to the diffusion-controlled constraint when the applied potential step exceeds a critical value. However, it was found that the critical value of the applied potential step for the mechanism transition determined from the surface-modified  $\text{LiMn}_2\text{O}_4$  film electrode was smaller than that obtained from the bare  $\text{LiMn}_2\text{O}_4$  film electrode, indicating that lithium transport through the surface-modified  $\text{LiMn}_2\text{O}_4$  film electrode is markedly enhanced. From the comparison between the ac-impedance spectra measured from the bare and surface-modified  $\text{LiMn}_2\text{O}_4$  film electrodes, the enhanced lithium transport through the surface-modified  $\text{LiMn}_2\text{O}_4$  film electrode can be accounted for by the kinetic facility for the interfacial charge-transfer reaction in the presence of the conductive surface film.

### **References**

1. J.-W. Lee and S.-I. Pyun, *Electrochim. Acta*, 49 (2004) 753.
2. J.-Y. Go and S.-I. Pyun, *Electrochim. Acta*, 49 (2004) 2551.