

## BF18

### Thermodynamic and Kinetic Approaches to Lithium Intercalation into Sol-gel Derived $\text{Li}_{1-\delta}\text{Mn}_2\text{O}_4$ Electrode

졸-겔법으로 제조한  $\text{Li}_{1-\delta}\text{Mn}_2\text{O}_4$  전극내로의 리튬 인터칼레이션에  
대한 열역학 및 속도론적 연구

김성우, 변수일

한국과학기술원 재료공학과

Electrochemical lithium intercalation into  $\text{Li}_{1-\delta}\text{Mn}_2\text{O}_4$  electrode prepared by sol-gel method was investigated from the thermodynamic and kinetic view points by using galvanostatic intermittent titration technique (GITT) combined with electromotive force (EMF)-temperature measurement and potentiostatic current transient technique. The electrode potential vs. lithium content curve was theoretically calculated with the aid of the lattice gas model based upon the Bragg-Williams approximation for the cubic spinel composed of two sub-lattices. Considering the considerable difference between both lithium contents in two sub-lattices due to the ordering of the intercalated lithium ions, the theoretical partial molar enthalpy and entropy were calculated at various lithium contents by a numerical method. The theoretical partial molar quantities were in a good agreement with experimental results obtained from the temperature dependence of the electrode potential at various lithium contents. The cathodic and anodic current transients experimentally measured from the electrode showed non-Fickian behaviour of lithium transport. From the abnormal behaviour of the partial molar quantities and current transients, the electrochemical lithium intercalation into the  $\text{Li}_{1-\delta}\text{Mn}_2\text{O}_4$  electrode was discussed in terms of the ordering of the intercalated lithium ions.

#### References

1. J.R. Dahn and W.R. Mckinnon, J. Electrochem. Soc., 131 (1984) 1823.
2. Y. Gao, J.N. Reimers and J.R. Dahn, Phys. Rev. B, 54 (1996) 3878.
3. S.-I. Pyun and S.-W. Kim, press in Mol. Cryst. & Liq. Cryst. (1999).