특별강연

Mechanisms of Lithium Transport through Transition Metal Oxides and Carbonaceous Materials
전이 금속 산화물과 탄소 재료 내 리튬의 이동 기구에 관한 연구

변수일
한국과학기술원 재료공학과

Lithium transport through transition metal oxides and carbonaceous materials has been usually modelled on the grounds of a 'diffusion controlled' concept, *i.e.* slow diffusion of lithium in the electrode, preceded by an extremely fast charge transfer reaction at the interface between electrode and electrolyte. On the basis of this concept, the chemical diffusivity of lithium in the electrode has been frequently determined by the current transient technique (chronoamperometry), and the value of the estimated diffusivity has been found to be reasonable. We show that in the case of such transition metal oxides as $LiNiO_2$, $LiCoO_2$, $Li_{4/3}Ti_{5/3}O_4$, and V_2O_5, and finally graphite, this concept of 'diffusion control' and the resulting values of diffusivity arising from application of this concept should be invalidated. Further, from analyses of the experimental current transients, we suggest that the internal cell resistance crucially affects the shapes and values of those transients. Finally, we theoretically determine the current transients under the assumption of lithium transport being controlled by 'cell-impedance' at the interface between electrode and electrolyte, followed by diffusion of lithium in the electrode.

Reference

1. H.-C. Shin and S.-I. Pyun, Modern Aspects of Electrochemistry, Number 36, R.E. White *et al.* Eds, Kluwer Academic/Plenum Publishers, New York, 2002, Chapter 5, pp. 255/301.