BFA03

Effect of 'Cell-impedance' on Lithium Transport through $Li_{1-\delta}CoO_2$ Film Electrode Prepared by RF-magnetron Sputtering

RF-마그네트론 스퍼터링으로 제조된 $Li_{1-\delta}CoO_2$ 박막 전극을 통한 리튬 이동에 미치는 '셀-저항'의 영향

고주영, 변수일, 신헌철
한국과학기술원 재료공학과

Lithium transport through $Li_{1-\delta}CoO_2$ film electrode prepared by RF-magnetron sputtering was investigated in a 1 M solution of $LiClO_4$ in propylene carbonate using galvanostatic intermittent titration technique (GITT), electrochemical impedance spectroscopy (EIS) and potentiostatic current transient technique. All the experimental cathodic and anodic current transients did not follow Cottrell behaviour, but ohmic behaviour. This means the relationship between initial current in current transient and applied potential step obeys the Ohm's law. In addition, the current transients obtained in the coexistence of two phases showed 'quasi -current plateau'. After the charge was consumed enough to arrive at quasi-current plateau region, the value of the plateau current was also proportional to be the difference in value between the applied potential and the plateau potential. From these results, it was strongly suggested that lithium transport through $Li_{1-\delta}CoO_2$ film electrode is purely controlled by cell-impedance not only in the presence of single phase but also in the coexistence of two phases. The value of 'cell-impedance' calculated from the current transient was almost equal to be those obtained from EIS and GITT. The current transients were numerically simulated under the condition of the 'cell-impedance controlled' lithium transport. The current transients theoretically calculated coincided well with those experimentally measured in value and shape.

Reference

1. H.-C. Shin, and S.-I. Pyun, Electrochim.Acta 45 (1999) 489.