BFA04

The Kinetic Approach to Lithium Transport through Carbonaceous Electrodes by Theoretical Analysis of Current Transient

전류 추이 곡선의 이론적 해석을 통한 탄소전극내로의 리튬이온 이동에 관한 속도론적 연구

이승복, 변수일
한국과학기술원 재료공학과

Lithium transport through carbonaceous composite electrode was investigated in a 1M $LiPF_6$ - ethylene carbonate (EC) / diethyl carbonate (DEC) (50:50 vol.%) electrolyte. For this purpose, the cathodic and anodic current transients were obtained from the electrodes as functions of applied potential step and degree of crystallinity of the carbon. The current transient obtained from the graphite electrode exhibited the non-Cottrell behaviour throughout the intercalation/deintercalation time, irrespective of the potential steps. Moreover, the initial current level was linearly proportional to be the applied potential drop and jump, which means that the current-potential relation follows Ohm's law. From the coincidence of the two current transients experimentally obtained and theoretically calculated, it is suggested that the occurrence of this abnormal behaviour is due to a 'cell-impedance-controlled' lithium transport, not a 'diffusion-controlled' lithium transport. To investigate the effect of the structural change of carbon on the lithium transport, we also extended our research work from graphite electrode with high degree of crystallinity to hard carbon electrode with low degree of crystallinity. The mechanism of lithium transport into various carbonaceous electrodes was discussed in terms of the structural change of carbonaceous material.

References

1. H.-C. Shin, and S.-I. Pyun, Electrochim. Acta 45 (1999) 489.
2. S.-I. Pyun, and S.-B. Lee, submitted to J. Power Sources for publication (2000).