

## BFA4

### Lithium Transport through Electrodeposited Vanadium Pentoxide Film Electrode by Ac-Impedance Analysis

교류 임피던스 해석을 통한 전기 도금된  $V_2O_5$  박막  
전극 내로의 리튬 이동에 관한 연구

이종원 · 변수일

한국과학기술원 재료공학과

Lithium intercalation into and deintercalation from vanadium pentoxide film electrode were investigated in a 1 M solution of  $LiClO_4$  in propylene carbonate (PC) by using ac-impedance spectroscopy. Vanadium pentoxide film specimens were electrochemically deposited on Pt-coated alumina at 1.0  $V_{SCE}$  for 3 h in 0.1 M  $VOSO_4$  solution. The electrodeposited film specimen was further dried under vacuum either at 100 °C for 1 h or at 240 °C for 3 h.

The Nyquist plot of ac-impedance spectra measured on the film electrode exhibited a depressed arc in the high frequency range, a straight line inclined at constant angle to the real axis and a capacitive line in the low frequency range. The high frequency arc is associated with the absorption reaction of lithium ions at the electrode/electrolyte interface and the low frequency straight line is due to diffusion of lithium ions in the film electrode. The absorption resistance for the film electrode dried at 100 °C was determined to be larger in value than that for the film electrode dried at 240 °C by two or three times, suggesting that the water molecules incorporated into the film electrode during the electrodeposition process impede the absorption of lithium ions into the film electrode. Moreover, the ac-impedance spectra for the film electrode dried at 100 °C showed the straight line with the slope between 30 and 45 °C in the low frequency range, depending on the electrode potential.

This anomalous behaviour of diffusion impedance was discussed in terms of the lithium ion diffusion through the disordered oxide lattice induced by the incorporation of water molecules into the film electrode.

#### Reference

1. S.-I. Pyun and J.-S. Bae, J. Power Sources 68 (1997) 669.