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An Investigation of the Effect of the Pore Structure on Lithium Transport through the Porous Vanadium Pentoxide Film electrode in terms of Fractal Geometry

프랙탈 기하학을 이용한 기공성 V_2O_5 박막 전극 내로의 리튬 이동에 미치는 기공 구조의 영향에 관한 연구

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The effect of the pore structure on lithium transport through the porous V_2O_5 film electrode was investigated in terms of fractal geometry using nitrogen gas adsorption method and ac-impedance spectroscopy. For this purpose, the porous V_2O_5 films with various pore structures were electrochemically deposited by using non-ionic polymer surfactant as template. From the analyses of the nitrogen gas adsorption/desorption isotherms obtained from the porous V_2O_5 film electrodes prepared with different amounts of the polymer surfactant, it was found that the average pore diameter and the broadness of pore size distribution increased with increasing amounts of the polymer surfactant, which is attributable to more aggregation of polymer surfactant molecules. In addition, it was noted that the surface fractal dimension of the pore determined by using the multilayer gas adsorption theory decreased with increasing amounts of the polymer surfactant. From these results, it was suggested that as the surfactant-templated pores comprising the V_2O_5 film agglomerate, the surface fractal dimension of that pore surface decreases. Furthermore, on the basis of fractal geometry, the ac-impedance spectra measured on the porous V_2O_5 film electrodes with different pore structures have been analysed to quantitatively discuss the effect of the pore structure on lithium transport through the porous V_2O_5 film electrode.

References

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