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Effect of Microstructural Change on the Lithium Transport through a Soft Carbon Electrode

연질탄소의 미세구조 변화가 탄소전극 내에서의 리튬 이동에 미치는 영향

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Effect of microstructural change on the lithium transport through a mesocarbon microbeads (MCMB) soft carbon heat-treated at low temperatures from 700 to 1000 ℃ was investigated in a 1 M $LiPF_6$ - ethylene carbonate (EC) / diethylene carbonate (DEC) (50:50 vol.%) solution by the analysis of potentiostatic current transients based upon the modified McNabb-Foster equation. For this purpose, open-circuit potential transients, potentiostatic current transients and ac-impedance spectra were first measured on the electrode, and then the current transients have been simulated by taking the modified McNabb-Foster equation as the governing equation along with 'cell-impedance-controlled' constraint as the boundary condition.

From the coincidence between the current transients experimentally measured and theoretically calculated, it is suggested that lithium transport through the MCMB electrode is limited by the 'cell-impedance', and at the same time the difference in the kinetics of lithium transport between through the three different lithium deintercalation sites is due to the difference in the activation energy for lithium deintercalation between from the three different lithium deintercalation sites present within the MCMB. Based upon the experimental and theoretical findings, lithium transport through the MCMB heat-treated at various temperatures was quantitatively analysed in terms of the difference in the relative amount of the lithium deintercalation sites with different activation energies for lithium deintercalation.

Reference

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