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Effect of Interaction between Lithium Ions on Lithium Transport : Analysis of Potentiostatic Current Transient Measured on $Li_{1+\delta}[Ti_{5/3}Li_{1/3}]O_4$ Film Electrode

$Li_{1+\delta}[Ti_{5/3}Li_{1/3}]O_4$ 박막 전극내의 리튬 이동에 미치는 리튬 이온들간의 상호작용의 영향 : $Li_{1+\delta}[Ti_{5/3}Li_{1/3}]O_4$ 박막 전극의 정전압 전류추이곡선의 해석

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Lithium transport through $Li_{1+\delta}[Ti_{5/3}Li_{1/3}]O_4$ film electrode was investigated from the kinetic view point by using potentiostatic current transient technique and electrochemical impedance spectroscopy (EIS) with the aid of Monte Carlo simulation. The electrode potential vs. lithium content curve measured on the $Li_{1+\delta}[Ti_{5/3}Li_{1/3}]O_4$ film electrode shows a wide potential plateau at 1.56 V_{Li/Li^+}, indicating a Li-poor phase α coexists with a Li-rich phase β due to the interaction between lithium ions. The relationship between initial current level and applied potential step determined from the current transients follows Ohm's law, which is responsible for the 'cell-impedance controlled' lithium transport. Both current transients, experimentally measured and theoretically calculated under the 'cell-impedance' controlled lithium transport by Monte Carlo simulation, show a wide current plateau alike. From the lattice configuration of lithium ions theoretically obtained from the Monte Carlo simulation and the variation of absorption resistance with lithium content experimentally measured from EIS, the phase transformation of Li-rich phase β to Li-poor phase α during the 'cell-impedance' controlled lithium transport is analysed by considering the interaction between lithium ions.

References

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