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The Kinetics of Lithium Transport through Lithium Cobalt Dioxide Electrode

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The kinetics of lithium transport through carbon-dispersed lithium cobalt dioxide composite electrode was investigated in 1M solution of $LiClO_4$ in propylene carbonate by theoretical analysis of current transient. The experimental cathodic and anodic current transients exhibited the non-Fickian behaviour of lithium transport, not only in the presence of a single phase but also in the coexistence of two phases of a Li-poor phase and a Li-rich phase. For the theoretical approach to this abnormal diffusion phenomenon, two different points of view were considered: one is a 'diffusion-controlled' lithium transport and the other is a 'cell-impedance' controlled lithium transport. From the comparison of experimentally obtained current transients with those theoretically calculated, it is suggested that lithium transport through the oxide electrode in the presence of a single phase is purely governed by cell-impedance. However, the occurrence of the non-Fickian behaviour during lithium intercalation into and deintercalation from the electrode in the coexistence of two phases is accompanied by a 'diffusion-controlled' phase transformation and 'cell-impedance' controlled phase transformation, respectively.

References

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