Effects of Citric Acid Treatment on the Electrochemical Properties of $\text{Li}_{1.2}\text{Mn}_{0.54}\text{Ni}_{0.13}\text{Co}_{0.13}\text{O}_2$ Cathode Material

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The influence of citric acid pre-activation on the electrochemical properties of cathode materials used in lithium batteries is investigated. During the citric acid pre-activation of the surface of coprecipitated $\text{Li}_{1.2}\text{Mn}_{0.54}\text{Ni}_{0.13}\text{Co}_{0.13}\text{O}_2$, 13.37 wt.% of lithium is removed, mainly owing to the decomposition of the Li_2MnO_3 . Electrochemical property tests indicate that the cycle performance and rate capability of the material are enhanced after citric acid pre-activation. The initial charge-discharge efficiency increases from 66.4% to 79.9%, while the capacity retention after 100 cycles at 0.5C increases from 84.85% to 90.81%. When the current density increases to 5C, the specific discharge capacity of the delithiated material is $108.9 \text{ mAh}\cdot\text{g}^{-1}$, much higher than that ($95.10 \text{ mAh}\cdot\text{g}^{-1}$) before the treatment. This is caused by the formation of a spinel-like structure on the cathode surface, as citric acid removes some of the Li_2O in the Li_2MnO_3 phase. As a result, a channel for Li^+ transmission is created and the impedance at the interface between the cathode material and the electrolyte is effectively reduced, facilitating the rapid transport of Li^+ through the electrode interface.

Keywords: Surface modification; $\text{Li}_{1.2}\text{Mn}_{0.54}\text{Ni}_{0.13}\text{Co}_{0.13}\text{O}_2$; Citric Acid; Electrochemical performance

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