The Effect of Heating Rate on the Structure and Electrochemical Performance of the Li-rich Cathode Material $\text{Li}_{1.2}\text{Ni}_{0.15}\text{Co}_{0.10}\text{Mn}_{0.55}\text{O}_2$ Prepared Using the Co-precipitation Method

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The lithium-rich cathode material $\text{Li}_{1.2}\text{Ni}_{0.15}\text{Co}_{0.10}\text{Mn}_{0.55}\text{O}_2$ was prepared via co-precipitation and solid-phase sintering. The morphology, electrochemical properties and storage properties of the sample under different heating rates were measured using SEM, XRD, an electrochemical workstation, a battery test system and ICP (solubility). Our results show that the morphology and electrochemical performance of the prepared cathode material can be effectively controlled by adjusting the heating rate during the sintering process. At a 20 °C/min heating rate, a layered structure with good crystallinity and low-cation mixing can be formed. In the 3.0–4.8 V range, 0.1 C, the 50-cycle capacity retention rate is 82.7%, and the discharge specific capacity can reach 131 mAh·g⁻¹ at 5 C; at the same time, the samples prepared at this temperature increase rate with a lower electrochemical transfer impedance. In addition, after the electrolyte was stored for 3 weeks, the concentration of Ni ions in the electrolyte was 39.44 ppm, which was significantly lower than that of other samples. From the study presented here, we have shown that controlling the heating rate in the sintering process can effectively regulate the structure of the cathode material and improve its electrochemical performance.

Keywords: Lithium-rich cathode material, heating rate, structure control, electrochemical performance

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