Molten Salt Synthesis of Disordered Spinel $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ with Improved Electrochemical Performance for Li-ion Batteries

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Disordered spinel $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ (LNMO) was successfully synthesised via a molten-salt method using a mixture of $\text{LiOH}\cdot\text{H}_2\text{O}$ and LiNO_3 salts. The precursor was annealed at 750, 850 or 950 °C for 12 h, and the effects of calcination temperature on the structure, morphology and electrochemical performance of the resultant LNMO were investigated. At 850 °C, LNMO exhibited a polyhedral shape approximately 0.75 μm in size with a specific surface area of 1.8135 $\text{m}^2 \text{g}^{-1}$. Electrochemical results indicated that, among the samples tested, the LNMO sample annealed at 850 °C exhibited the highest discharge capacity of 122 mAh g^{-1} at the 1st cycle; these samples also retained 97% of its capacity after 80 rounds of cycling at a rate of 0.2 C. The same sample showed excellent rate capability, indicating exceptional performance even at a high current density. The improved performance of the resulting electrode could be attributed to the homogeneity and small size of the LNMO particles; these characteristics help facilitate Li-ion transport by reducing the Li-ion pathway within the electrode material.

Keywords: Lithium-ion batteries; cathode; $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$; discharge capacity; rate capability.

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