Hydrothermal Synthesis and Electrochemical Performance of Micro-spherical $\text{LiNi}_{1/3}\text{Co}_{1/3}\text{Mn}_{1/3}\text{O}_2$ Cathode Material

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$\text{LiNi}_{1/3}\text{Co}_{1/3}\text{Mn}_{1/3}\text{O}_2$ (NCM) as a cathode material for lithium-ion batteries was synthesized using a modified hydrothermal method. The NCM electrode exhibited a porous spherical microstructure and improved electrochemical performances compared to the sample prepared by the co-precipitation method. Further, it delivered a high initial discharge capacity of 174.4 mAh g^{-1} at 0.2 C rate between 2.5 and 4.5 V, and a capacity of 123.8 mAh g^{-1} was reached at 10 C after cycling at various rates. At the high rate of 10 C, the NCM showed an initial discharge capacity of 132.7 mAh g^{-1} and with the capacity retention of 62.3 % after operating for 50 charge–discharge cycles. The excellent rate performance and cyclic stability can be ascribed to the porous structure with a large surface area that enhanced the chemical active nature of the cathode material, while providing more transport channels for the Li^+ ions. These results indicate that the potential of the suggested method in tuning the morphology of the NCM cathode material to improve its electrochemical performance.

Keywords: Lithium-ion battery, cathode material, hydrothermal method, microsphere

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