Hydrothermally-assisted co-precipitation and Electrochemical Performance of $\text{LiNi}_{1/3}\text{Co}_{1/3}\text{Mn}_{1/3}\text{O}_2$ Cathode Material

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Hydrothermally-assisted co-precipitation method is conducted to prepare the precursor of layered materials $\text{LiNi}_{1/3}\text{Co}_{1/3}\text{Mn}_{1/3}\text{O}_2$. The $\text{LiNi}_{1/3}\text{Co}_{1/3}\text{Mn}_{1/3}\text{O}_2$ cathode materials are synthesized after calcining the as-prepared precursor for different hours at 850 °C. The high-temperature and high-pressure conditions that the hydrothermal-assisted method possesses can rapidly improve the crystallization speed of $\text{LiNi}_{1/3}\text{Co}_{1/3}\text{Mn}_{1/3}\text{O}_2$ precursor also with the well-defined layer structures and low degree of cation mixing. As the result, the hydrothermally-assisted co-precipitation method can save almost half the time of precursor reaction and calcination compared with reported co-precipitation methods. At the same time, the good comprehensive electrochemical performance can be obtained with the large initial discharge capacity of $193.5 \text{ mAh}\cdot\text{g}^{-1}$ at 0.1 C ($1.0 \text{ C} = 183.0 \text{ mA}\cdot\text{g}^{-1}$), the capacity fading rate per cycle of only 0.016 % based on 135 cycles and the high-rate discharge ability of $126 \text{ mAh}\cdot\text{g}^{-1}$ at 4.0 C. Adopting the hydrothermally-assisted co-precipitation method is very helpful to boost the utilization of production equipments and reduce the manufacturing cost of the $\text{LiNi}_{1/3}\text{Co}_{1/3}\text{Mn}_{1/3}\text{O}_2$ material.

Keywords: hydrothermally-assisted co-precipitation; $\text{LiNi}_{1/3}\text{Co}_{1/3}\text{Mn}_{1/3}\text{O}_2$; cathode; lithium-ion battery; production process

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