Ternary Cathode Materials $\text{LiNi}_{1/3}\text{Co}_{1/3}\text{Mn}_{1/3}\text{O}_2$ with High Electrochemical Performances Synthesized by Hydrothermal Synthesis with the Aid of Surfactants

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The ternary layered cathode materials $\text{LiNi}_{1/3}\text{Co}_{1/3}\text{Mn}_{1/3}\text{O}_2$ (LNCM) was successfully synthesized by hydrothermal process with the assistance of surfactant (sodium alkylbenzene sulfonate (SDBS), polyvinylpyrrolidone (PVP), cetyltrimethylammonium bromide (CTAB)). The effects of surfactants on the morphology, structure and electrochemical properties of the materials were investigated in detail. The structure and morphology of the materials was characterized by XRD and SEM respectively, and the electrochemical properties of the materials including initial charge and discharge, cycle and rate performances, as well as electrochemical impedance spectroscopy (EIS) were studied by means of electrochemical workstation and battery comprehensive performance tester. The results showed that the material synthesized with the aid of SDBS had more uniform size, better dispersion and better crystallinity. In the voltage range of 2.5 ~ 4.6 V, the initial discharge specific capacity reached 184.66 mA·h/g, and the capacity retention rate remained at 87.03% after 100 cycles at 0.5 C. It indicated that our synthesized LNCM material had good morphology, structure and electrochemical performances. Therefore, choosing the ideal surfactant is a very effective method to assist the synthesis of high-performance cathode material.

Keywords: $\text{LiNi}_{1/3}\text{Co}_{1/3}\text{Mn}_{1/3}\text{O}_2$ (LNCM); Surfactant assisted synthesis; Hydrothermal; Electrochemical performances

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