The Synthesis and Electrochemical Property of Spinel Cathode Material $\text{Li}_{1.05}[(\text{Mn}_{1.99}\text{Gd}_{0.01})_{0.91}(\text{Mn}_{1.8}\text{Co}_{0.2})_{0.09}]\text{O}_4$ for Lithium-Ion Batteries

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Novel spinel $\text{Li}_{1.05}[(\text{Mn}_{1.99}\text{Gd}_{0.01})_{0.91}(\text{Mn}_{1.8}\text{Co}_{0.2})_{0.09}]\text{O}_4$ as cathode material for Li-ion battery was prepared through two-step solid-state reaction and treatment by Li-Mn-Co-O material on the surface of $\text{Li}_{1.05}[\text{Mn}_{1.99}\text{Gd}_{0.01}]\text{O}_4$ particles. The physical and electrochemical properties of the materials were analyzed by X-ray diffraction (XRD), scanning electron microscopy (SEM), cyclic voltammetry (CV) and charge-discharge test. The novel material showed improved electrochemical properties compared with the pristine LiMn_2O_4 , especially at elevated temperature. The initial discharge capacity of the $\text{Li}_{1.05}[(\text{Mn}_{1.99}\text{Gd}_{0.01})_{0.91}(\text{Mn}_{1.8}\text{Co}_{0.2})_{0.09}]\text{O}_4$ was 128.0 mAh g^{-1} with a fading rate of 0.041% per cycle at 25°C. Moreover, the cycle ability was improved more evidently at 55°C, the retentions ratio of capacity was up to 91% for the novel material after 100 cycles.

Keywords: Lithium-ion battery; Cathode material; Spinel; Solid-state reaction

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