Effect of Heat Treatment Time on Electrochemical Performance of $\text{LiMg}_{0.04}\text{Mn}_{1.96}\text{O}_4$ cathode Materials Synthesized by a Solid-State Combustion Method

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$\text{LiMg}_{0.04}\text{Mn}_{1.96}\text{O}_4$ cathode materials were successfully prepared by a solid-state combustion method at temperature of 500°C for 1h and then calcined at 600°C for different heat treatment time. The heat treatment time was investigated, and the crystal structure, morphologies of prepared samples were characterized by X-ray diffraction(XRD) and scanning electron microscopy(SEM). XRD results revealed that the crystallinity of prepared samples increased with increasing of heat treatment time. SEM results confirmed that the average particle size of prepared samples increased with the increasing of heat treatment time. The narrow particle size distribution of prepared samples consisted of particles in the range of 0.1-0.5 μm . The electrochemical performance of synthesized samples was studied by galvanostatic charge/discharge tests and cyclic voltammetry (CV). Results showed that the $\text{LiMg}_{0.04}\text{Mn}_{1.96}\text{O}_4$ material calcined at 600°C for 6h delivered better electrochemical properties with higher initial discharge specific capacity of 112.4mAh/g at room temperature and 110.8mAh/g at 55°C at 0.2C rate, and the capacity retention rates were 93.0% after 40 cycles at room temperature and 70.58% after 45 cycles at 55°C at 0.2C rate, respectively.

Keywords: Solid-State combustion method; Mg-doping; LiMnO_4 ; Heat treatment time; Lithium ion batteries

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