The Effect of Calcination Time on the Electrochemical Performance of Spinel $\text{LiMg}_{0.08}\text{Mn}_{1.92}\text{O}_4$ Prepared by a Solid-State Combustion Method

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Mg-doped cathode material $\text{LiMg}_{0.08}\text{Mn}_{1.92}\text{O}_4$ was synthesized by a solid-state combustion method at 500°C for 1h and then two-stage calcination at 600°C for 3 h, 6 h, 9 h, 12 h, respectively. The effect of two-stage calcination time on the electrochemical properties of spinel $\text{LiMg}_{0.08}\text{Mn}_{1.92}\text{O}_4$ was investigated by XRD, SEM, galvanostatic charge-discharge cycling test, cyclic voltammogram (CV) methods, electrochemical impedance spectroscopy (EIS) and X-ray photoelectron spectroscopy (XPS). The XRD results indicate that Mg substituting of Mn does not change the spinel structure of LiMn_2O_4 as calcination time goes on. SEM observations show particles possess octahedral morphology, with particle size in the range of 125.0-270.8nm. $\text{LiMg}_{0.08}\text{Mn}_{1.92}\text{O}_4$ prepared at 500°C for 1h and then two-stage calcination at 600°C for 3 h had excellent electrochemical performance with an initial discharge specific capacity of 107.3 mAh g⁻¹, and the capacity retention was 72.97% after 1000 cycles at 1 C, which is correspond to the smallest charge transfer resistance in all samples. The excellent electrochemical performance is due to Mg^{2+} dopant can improve structural of LiMn_2O_4 , as well as reducing the Jahn-Teller effect.

Keywords: Solid-State combustion; $\text{LiMg}_{0.08}\text{Mn}_{1.92}\text{O}_4$; Calcination time; Mg-doping; Lithium ion batteries;

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