Effect of Sintering time on $\text{Mn}^{3+}/\text{Mn}^{4+}$ Ratio and Rate Capability of Spinel $\text{Li}_{1.02}\text{Mn}_2\text{O}_4$

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The spinel $\text{Li}_{1.02}\text{Mn}_2\text{O}_4$ samples were synthesized at different sintering times (5 h, 10 h, 15 h, and 20 h) via a solid-state method. The Mn^{4+} content decreases from 84.32% to 77.52% as the synthesis time increases from 5 h to 20 h, as indicated by Mn 2p_{3/2} X-ray photoelectron spectra. The rate capability of $\text{Li}_{1.02}\text{Mn}_2\text{O}_4$ samples increased initially and then decreased as synthesis time increased from 5 h to 20 h. Our results show that $\text{Li}_{1.02}\text{Mn}_2\text{O}_4$ sample synthesized for 10 h has the best rate capabilities of 144.1 mAh/g, 138.2 mAh/g, 126 mAh/g, and 106.2 mAh/g at 0.1, 0.2, 0.5, and 1 C, respectively. We suggest that change in rate capability of the $\text{Li}_{1.02}\text{Mn}_2\text{O}_4$ samples with increased synthesis time is related to the modification of Mn^{4+} content in LiMn_2O_4 .

Keywords: Spinel LiMn_2O_4 ; $\text{Mn}^{3+}/\text{Mn}^{4+}$ ratio; High-rate performance.

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