Enhanced performance of BO_3^{3-} -doped $\text{Li}_3\text{V}_2(\text{PO}_4)_3/\text{C}$ cathode materials synthesized via a controllable sol-gel method

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BO_3^{3-} -doped $\text{Li}_3\text{V}_2(\text{PO}_4)_3/\text{C}$ cathode materials with novel high-capacity performance are prepared by a controllable sol-gel method. X-ray diffraction and transmission electron microscopy are used to determine the microstructures and microscopic features of the materials. The electrochemical properties of the samples are characterized using constant current tests. The results demonstrate that the electrochemical performances of the materials can be greatly improved by the introduction of an appropriate quantity of boric acid. More specifically, with a doping content of 0.05, the discharge capacity of the material reaches $172.6 \text{ mAh}\cdot\text{g}^{-1}$ in the first week, with a rate of 0.2 C and a potential range 2–4.3 V. In addition, with an increase in the rate to 5 C, this material continues to maintain a high capacity of $121.4 \text{ mAh}\cdot\text{g}^{-1}$. After 150 weeks of cycling at different rates, this material exhibits an initial capacity retention of 96.3%, thereby indicating its excellent capacity performance and stability.

Keywords: high-capacity performance; BO_3^{3-} -doped; cathode material; $\text{Li}_3\text{V}_2(\text{PO}_4)_3/\text{C}$; lithium-ion battery

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