Hydrothermal-assisted Synthesis of $\text{Li}_2\text{FeSiO}_4/\text{C}$ Composites as Cathode Materials for Lithium-Ion Batteries

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Orthosilicate $\text{Li}_2\text{FeSiO}_4$ composites have recently attracted increasing attention as cathode materials of lithium-ion batteries (LIBs). However, diffusion-controlled kinetics of electrochemical processes limited their widespread applications. Carbon coatings are often deposited to improve the electrochemical performances of $\text{Li}_2\text{FeSiO}_4$ based cathode materials. In this work, hydrothermal assisted sol-gel method was used to prepare $\text{Li}_2\text{FeSiO}_4/\text{C}$ electrode materials using sucrose as carbon source. Structures, morphologies, and electrochemical behaviors of obtained cathode materials were analyzed by X-ray diffraction, scanning electron microscopy, electrochemical impedance spectroscopy and galvanostatic charge-discharge measurements. The electrode material prepared using 2 wt% sucrose displayed the best initial discharge specific capacity reaching 174 mAh/g at 0.1 C and superior rate performance with 95.3% retention capacity. These improved electrochemical properties were attributed to well-developed hierarchical porous structure, enhanced Li-ion diffusion coefficient, and large exchange current of as-obtained electrode materials.

Keywords: Cathode materials; $\text{Li}_2\text{FeSiO}_4/\text{C}$; Electrochemical properties; Hierarchical porous structure

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