Magnetic Activation of a LiFePO₄@C Composite Cathode Material

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A LiFePO₄@C composite cathode material was prepared from LiH₂PO₄, FeC₂O₄·2H₂O and glucose via a ball-milling and spray-drying technique and was then processed by carbothermal reduction and a magnetizing treatment. The samples were characterized by VSM, XRD, SEM, EDS, XPS and electrochemical analyses. The results reveal that LFP@C has a spherical morphology with a microstructure of aggregated nanoparticles. The magnetizing treatment can change the magnetic properties of the as-prepared sample slightly and therefore slightly enhance the initial discharge capacity. The sample subjected to a 72 h-magnetizing treatment delivers an initial discharge capacity of 155 mAh g⁻¹ at 0.1 C, an initial coulomb efficiency of 96.03 %, as well as improved low-temperature discharge characteristics. The CV curves and EIS demonstrated that the magnetizing treatment can reduce the polarization and charge-transfer resistance for LFP@C composite electrodes. The magnetizing treatment, which plays a role in the magnetic activation of the sample, results in the improvement of the electrochemical properties to a certain extent for LFP@C composite electrodes. In addition, there is no effect on the crystal structure or morphology, but the peak of the binding energy for Fe 2p_{1/2} changes.

Keywords: Cathode material; LiFePO₄; Magnetic activation; Li-ion batteries

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