Effect of Carbon Coating on the Properties and Electrochemical Performance of LiFePO₄/C Composites by Vacuum Decomposition Method

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A modified method of carbon coating by vacuum decomposition was employed to synthesize nanosized LiFePO₄/C cathode material. Sucrose, polyvinyl alcohol (PVA) and citric acid (CA) were used as different carbon resource and their pyrolysis behavior on the properties of the LiFePO₄/C composite was also investigated. During vacuum decomposition process, the organic carbon suppressed particle growth and decreased particle agglomeration, resulting in homogeneous carbon coated material. Among them, the sucrose coated LiFePO₄/C sample exhibited reduced particle size, regular spherical grains and graphitized carbon coating, indicating an enhancement to electrochemical performance. The sample delivered high specific capacity of 123.9 mAh/g at 5C and good capacity retention of 96.2% after 100 cycles at 1C. A comparison of carbon coating by traditional argon atmosphere and vacuum condition further demonstrated that vacuum decomposition method is conducive to refining particle for better carbon coating, leading to dramatically improved electrode polarization and rate performance of LiFePO₄/C composite.

Keywords: Lithium-ion battery, Lithium iron phosphate, carbon coating, vacuum decomposition method

FULL TEXT

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