Optimization of carbon coating on lithium iron phosphate ($LiFePO_4$) nanoparticles using continuous supercritical hydrothermal synthesis and solid-state method

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Lithium iron phosphate ($LiFePO_4$) has been proposed for using a potentially cathode material. In this study, carbon-coated LiFePO4 (C-$LiFePO_4$) were synthesized by the continuously supercritical hydrothermal synthesis (SHS) method and enhanced up using a simple carbon coating method. The object of this study is to prepare single phase, nanosize and single crystal LiFePO4 particles using continuous SHS and then their electrochemical performance is to enhance up using a simple method. LiFePO4 particles were characterized in detail using X-ray diffraction (XRD), scanning electron microscopy (SEM), Brunauer, Emmet, and Teller (BET) analysis, thermal gravimetric analysis (TGA), Raman spectrometer, transmission electron microscopy (TEM) and charge/discharge testing. The crystallinity is responsible for the highly performance of the LiFePO4 particles hydrothermally synthesized under supercritical water condition. And the as-SHS LiFePO4 delivers reversible capacity of about 140 mAh g^{-1} at a current density of C/10 rate with carbon coating.