Continuous Synthesis of Lithium Iron Phosphate ($LiFePO_4$) using Supercritical Water and its Electrochemical Properties

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Lithium iron phosphate (LiFePO4) has been attracted much attention as a promising cathode active material due to its valuable properties. This includes high stability at elevated temperature, safety under abusive conditions, good energy density, low cost of the starting materials, and lack of toxicity. These valuable properties of LiFePO4 make it suitable for large scale applications such as hybrid electric vehicles (HEV) or plug in hybrid electric vehicle (PHEV). Supercritical hydrothermal synthesis (SHS) is a very promising method to produce high-quality, highly crystalline, and nanosize metal oxide particles. The object of this study is to prepare single phase, nanosize and single crystal LiFePO4 particles using continuous SHS. LiFePO4 particles were characterized in detail using SEM, XRD, BET analysis, and charge/discharge testing. The particles have a small size (7-25 m2/g for BET surface area) and have been controlled their morphology. The crystallinity is responsible for the highly performance of the LiFePO4 particles hydrothermally synthesized under supercritical water condition. The LiFePO4 delivers reversible capacity of ~ 110 mAh/g at a current density of C/10 without carbon coating.