Bio-Synthesis of LiFePO_4/C composites for lithium ion battery

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According to the biomineralization assembly concept, high-performance LiFePO_4/C composites are successfully obtained via an effective and controllable biomimetic sol-gel method. The key step of this method is using the Baker's yeast cells as structural templates and biocarbon sources. The phase identification of four different LiFePO_4/C composites are tested by X-ray diffraction (XRD), scanning electron microscopy (SEM) and transmission electron microscopy (TEM), which are used to research the morphology, size and structure of LiFePO_4/C composites. And the electrochemical performance tests demonstrate when the amount of Baker's yeast cells are 20 g L^{-1} , LiFePO_4/C composites exhibit the best discharge specific capacity, 151.6 mAh g^{-1} at 0.1 C , which is higher than the pristine LiFePO_4 electrode (116.8 mAh g^{-1} at 0.1 C) without Baker's yeast cells. After 50 cycles at 0.1 C , the discharge capacity maintains 147.8 mAh g^{-1} (97.5% of its initial value). Also, the sample LiFePO_4/C with 20 g L^{-1} yeast cells shows a couple of redox peaks between 3.34 V to 3.53 V which is narrower and incisive, and the resistance is much smaller than other samples. Therefore the LiFePO_4/C composites synthesized by yeast cells are an ideal type of cathode-active material for lithium ion batteries.

Keywords: LiFePO_4/C composites, yeast cells, biocarbon, electrochemical performance

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