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 20g L$^{-1}$, LiFePO$_4$/C composites exhibit the best discharge specific capacity, 151.6mAh g$^{-1}$ at 0.1C, which is higher than the pristine LiFePO$_4$ electrode (116.8mAh g$^{-1}$ at 0.1C) without Baker’s yeast cells. After 50 cycles at 0.1C, the discharge capacity maintains 147.8mAh 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 3.34V to 3.53V 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

FULL TEXT

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