A Simple and Low-cost Synthesis Strategy of LiFePO_4 Nanoparticles as Cathode Materials for Lithium Ion Batteries

Huiting Zhu, Cui Miao, Ruitong Guo, Ying Liu and Xingyao Wang*

Department of Chemistry, School of Sciences, Tianjin University, Tianjin, 300350, China

*E-mail: wxxyghw@163.com

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In this work, pure LiFePO_4 nanoparticles have been synthesized by a one-step facile hydrothermal stripping method. This particular method is environmentally friendly and cost-effective, allowing the recycling of solvents. The preparation procedure involves an aqueous solution and an organic phase. The organic phase is naphthenic acid loaded with ferrous ion. Since the extraction process can purify ferrous ions, inexpensive industrial-grade $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ can be used as a raw material. The aqueous solution contains H_3PO_4 and LiOH . Pure LiFePO_4 nanoparticles were synthesized by stripping ferrous ion from the organic phase and reacting precipitation in aqueous phase. The effect of various parameters, involving PH value, reactant concentration, amount of reducing agent, temperature and time on the properties of LiFePO_4 was examined. By comparing the electrochemical properties of samples with different morphologies and particle sizes as cathode materials for lithium-ion batteries, the optimum LiFePO_4 nanoparticles exhibited a high specific discharge capacity of 156.1 mAh g^{-1} at 0.1 C after 40 cycles, revealing their adequate cycling performance.

Keywords: Lithium iron phosphate; Lithium-ion batteries; Cathode materials; A one-step method

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