Delithiation of LiFePO₄ by chemical oxidation reaction using H₂O₂ and K₂S₂O₈

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Triphylite LiFePO₄ is presently used as an active material in lithium batteries because of its thermal and electrochemical stability, high specific capacity, low cost and relative safety and non-toxicity. The low electronic conductivity and slow diffusion of lithium can prevent LiFePO₄ from reaching its theoretical specific capacity of 170 mAh/g[1]. The structure of LiFePO₄ is orthorhombic olivine; however, once the lithium is extracted, the structure becomes orthorhombic heterosite. The extraction of lithium can be accomplished by either electrochemical or chemical oxidation. In this work, chemical oxidation of LiFePO₄ was performed to study its oxidation kinetics and its particle surface properties. LiFePO₄ was delithiated for two hours in a mixture of oxidants (H₂O₂ or K₂S₂O₈), water, and acetic acid[2]. The Li₁₋ₓFePO₄ obtained was analyzed by atomic emission spectroscopy (ICP-OES), x-ray diffraction (XRD), infrared spectroscopy (FT-IR-ATR) and Raman spectroscopy. Delithiated LiFePO₄ can be used as an oxidant in industrial processes for LiFePO₄ coated by conductive polymers, as well as a cathode in lithium batteries, for anodes the a synthesized in the charged state.

Fig. 1: XRD of LiFePO₄ completely delithiated with H₂O₂ and K₂S₂O₈

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