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Delithiation of $LiFePO_4$ by chemical oxidation reaction using H_2O_2 and $K_2S_2O_8$

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Triphylite $LiFePO_4$ 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 $LiFePO_4$ from reaching its theoretical specific capacity of 170 mAh/g[1]. The structure of $LiFePO_4$ 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 $LiFePO_4$ was performed to study its oxidation kinetics and its particle surface properties. $LiFePO_4$ was delithiated for two hours in a mixture of oxidants (H_2O_2 or $K_2S_2O_8$), water, and acetic acid[2]. The $Li_{(1-x)}FePO_4$ obtained was analyzed by atomic emission spectroscopy (ICP-OES), x-ray diffraction (XRD), infrared spectroscopy (FT-IR-ATR) and Raman spectroscopy. Delithiated $LiFePO_4$ can be used as an oxidant in industrial processes for $LiFePO_4$ coated by conductive polymers, as well as a cathode in lithium batteries, for anodes the a synthesized in the charged state.

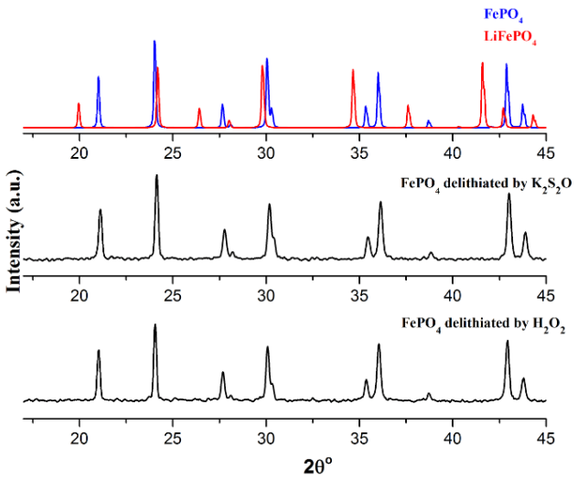

Fig. 1: XRD of $LiFePO_4$ completely delithiated with H_2O_2 and $K_2S_2O_8$

References:
[1] A. K. Padhi, K. S. Nanjundaswamy and J. B. Goodenough, *Journal of The Electrochemical Society* 1997, *144*, 1188-1194.
[2] a) J. L. Dodd, R. Yazami and B. Fultz, *Electrochemical and Solid-State Letters* 2006, *9*, A151-A155; b) D. Lepage, C. Michot, G. Liang, M. Gauthier and S. B. Schougaard, *Angewandte Chemie International Edition* 2011, *50*, 6884-6887.