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Effect of Iron-based Impurities on the performance of nanostructured C-LiFePO<sub>4</sub> cathode materials for Li ion Batteries P. VAISHNAVA, Kettering University, A. DIXIT, K. BAZZI, M.B. SAHANA, C. SUDAKAR, Wayne State University, M. NAZRI, Applied Sciences, Inc. Cedarville, Ohio, V. NAIK, University of Michigan - Dearborn, V.K. GARG, A.C. OLIVEIRA, Universidade de Brasilia, Brazil, G.A. NAZRI, R. NAIK, Wayne State University — We report synthesis of pure and C-LiFePO<sub>4</sub> nanoparticles in 20-30 nm size by solgel method. Three samples of C-LiFePO<sub>4</sub> were prepared by mixing 0.25M, 0.50M, and 1M lauric acid in the precursor solutions for carbon coating the particles. The samples were characterized by X-ray diffraction (XRD), X-ray photoelectron spectroscopy (XPS), IR spectroscopy, SQUID magnetometery, Raman spectroscopy, and Fe<sup>57</sup> Mössbauer spectroscopy. All the samples were thoroughly investigated for their electrochemical properties. The XRD measurements showed all the samples are single phase materials with no impurity phase. However, we identified at least three residual non crystalline impurity phases simultaneously using  $\rm Fe^{57}M\ddot{o}ssbauer$  spectroscopy, XPS, and the magnetic measurements. The elemental chemical states for Fe 2p, P 2p, and O 1s are analyzed using XPS for LiFePO<sub>4</sub> and compared with those of C-LiFePO<sub>4</sub> materials. SQUID magnetometery measurements suggest an antiferromagnetic transition  $\sim 50$  K in both pure LiFePO<sub>4</sub> and C-LiFePO<sub>4</sub> samples. The role of various phases, such as FeP, Fe<sub>2</sub>P,  $\alpha$ -Fe and Fe<sub>2</sub>O<sub>3</sub>identified and analyzed by  $Fe^{57}$  Mössbauer spectroscopy and XPS, will be discussed in relationship to the electrochemical properties of the cathode materials. Kettering University

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