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Effect of Surfactants on the Physical Properties and Electrochemical Performance of $LiFePO_4$ Cathode Material for Lithium Ion Batteries
K. BAZZI, Wayne State University, M. NAZRI, Applied Sciences Inc., P. VAISHNAVA, Kettering University, V.M. NAIK, University of Michigan-Dearborn, G.A. NAZRI, R. NAIK, Wayne State University — The lithium iron phosphate chemistry is plagued by the poor electronic conductivity and slow lithium ion diffusion in the solid phase. In order to solve these problems, various research groups have adopted different strategies including decreasing the particle size, covering the particles with carbon, and adding dopants to the cathode material. Here, we report synthesis of C-$LiFePO_4$ cathode materials using 0.25M lauric, myristic, and oleic acid as surfactants. The phase purity of all three C-$LiFePO_4$ was confirmed by x-ray diffraction. SEM and TEM investigations reveal that the surfactants coat the $LiFePO_4$ particles uniformly with carbon and the coating reduces the particle size to 20-30 nm. Due to high electrical conductivity, controlled particle size and suitable microstructure, among the three $LiFePO_4$ coated samples, the sample with 0.25M lauric acid exhibited superior electrochemical performance in terms of specific capacity, the cycling stability and delivered high discharge capacity of 155, 150 and 123 $mAhg^{-1}$ at 0.5 C, 1C and 5C, respectively. The correlation between the ratio of the intensities of the D and G bands observed by micro-Raman spectroscopy, conductivity and electrochemical characteristics will be presented.

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