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Temperature dependent study of impurities in $LiFePO_4$/C nanoparticles and their impact on electrochemical performance KULWINDER SINGH DHINDSA, KHADIJE BAZZI, GHOLAM-ABBAS NAZRI, Wayne State University, Detroit, MI, US, VAMAN M. NAIK, University of Michigan-Dearborn, Dearborn, Michigan, US, VIJAYENDRA K. GARG, Universidade de Brasilia, Instituto de Fisica, Brasilia - DF, Brazil, ADERBAL C. OLIVEIRA, Unidade Universitária De Ciências Exatas E Tecnológicas, Universidade, PREM VAISHNAVA, Kettering University, Flint, Michigan, US, RATNA NAIK, ZHIXIAN ZHOU, Wayne State University, Detroit, MI, US — We have synthesized $LiFePO_4$/C nanoparticles using a simple sol-gel method followed by calcination at various temperatures from 600 °C to 900 °C. X-ray diffraction shows that samples annealed at 600° C are phase pure while those treated at higher temperatures contain Fe_2P and Li_3PO_4 impurity phases, which increase with increasing annealing temperature. Mossbauer spectroscopy and magnetic measurements were used to quantify the amount of Fe_2P impurity phase. Scanning electron microscopy measurement reveals a noticeable increase in particle size as the annealing temperature increases from 700 °C to 900 °C. Optimal results are obtained in $LiFePO_4$/C samples annealed at 700 °C, which show the lowest charge transfer resistance, highest Li-ion diffusion coefficient, the highest specific capacity of 166 mAh/g at a rate of 1C and the best rate capability and cycling stability among all samples.

Kulwinder Singh Dhindsa
Wayne State University, Detroit, MI, US

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