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Graphene modified $LiMPO_4$ (M=Fe, Mn) as a cathode material for lithium ion batteries KULWINDER DHINDSA, BALAJI PRASAD MANDAL, KHADIJE BAZZI, MING-WEI LIN, MARYAM NAZRI, GHOLAM ABBAS NAZRI, Wayne State University, Detroit Michigan, VAMAN M. NAIK, University of Michigan-Dearborn, Dearborn, Michigan, VIJAY K. GARG, A.C. OLIVEIRA, Universidade de Brasilia, Instituto de Fisica, Brasilia - DF, Brazil, PREM VAISHNAVA, Kettering University, Flint, Michigan, RATNA NAIK, ZHIXIAN ZHOU, Wayne State University, Detroit Michigan — We have synthesized $LiFePO_4$/graphene nanocomposites using sol-gel method by adding water dispersed graphene oxide to the $LiFePO_4$ precursors during the synthesis. The graphene oxide was subsequently reduced by annealing the composite at 600°C for 5h in forming gas (90% Ar and 10% H_2) which was confirmed by Raman spectroscopy and X-ray Photoelectron spectroscopy. Addition of graphene significantly improved the electronic conductivity of $LiFePO_4$. Scanning Electron microscopy and Transmission electron microscopy images show $LiFePO_4$ particles being covered uniformly by graphene sheets throughout the material forming a three dimensional conducting network. Cyclic voltammetry results show that composite is a typical two-phase system. Li ion diffusion coefficient calculations show two orders of magnitude enhancement. At low currents, (C/3), the capacity of $LiFePO_4$/graphene composite cathode reaches 160 mAh/g, which is very close to the theoretical limit. More significantly, the graphene modified $LiFePO_4$ shows a dramatically improved rate capability up to 27C, and excellent charge-discharge cycle stability over 500 stable cycles. In addition to $LiFePO_4$, $LiMnPO_4$/graphene composite has also been synthesized and the results will be discussed.

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