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Enhanced electrochemical performance of graphene modified $LiFePO_4$ as a cathode material for lithium ion batteries K.S. DHINDSA, B.P. MANDAL, M.W. LIN, M. NAZRI, G.A. NAZRI, Wayne State University, V.M. NAIK, University of Michigan-Dearborn, P. VAISHNAVA, Kettering Univeristy, R. NAIK, Z.X. ZHOU, Wayne State University — We have synthesized $LiFePO_4$/graphene nano-composites using a sol-gel method by adding water dispersed graphene oxide to the $LiFePO_4$ precursors during the synthesis. The graphene oxide was reduced by annealing the composite at 600°C for 5h in flowing forming gas (90% Ar and 10% H_2). The phase purity of the product was characterized by X-Ray diffraction and Raman spectroscopy. The reduction of graphene oxide was verified by Raman spectroscopy and X-ray Photoelectron spectroscopy. The electronic conductivity of $LiFePO_4$/graphene composite was found to be six orders of magnitude higher than that of pure $LiFePO_4$ synthesized following otherwise the same procedure except that no graphene oxide was added. SEM and TEM images show that $LiFePO_4$ particles are wrapped in uniformly distributed graphene sheets throughout the material forming a three dimensional conducting network. At low currents, the capacity of the composite cathode reaches 160 mAh/g, which is very close to the theoretical limit. More significantly, the graphene wrapped $LiFePO_4$ shows a dramatically improved rate capability and excellent charge-discharge cycle stability in comparison with the $LiFePO_4$ without graphene.

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