Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Solvothermal synthesis of Mg-doped Li_2FeSiO_4/C nanocomposite cathode materials for lithium-ion batteries AJAY KUMAR, Wayne State University, O.D. JAYAKUMAR, Bhabha atomic research centre, V.M. NAIK, University of Michigan Dearborn, G.A. NAZRI, R. NAIK, Wayne State University — Lithium transition metal orthosilicates, such as Li_2FeSiO_4 and Li_2MnSiO_4, as cathode material have attracted much attention lately due to their high theoretical capacity (˜330 mAh/g), low cost, and environmental friendliness. However, they suffer from poor electronic conductivity and slow lithium ion diffusion in the solid phase. Several cation-doped orthosilicates have been studied to improve their electrochemical performance. We have synthesized partially Mg-substituted $Li_2Mg_xFe_{1-x}SiO_4$-C, ($x = 0.0$, 0.01, 0.02, and 0.04) nano-composites by solvothermal method followed by annealing at 600°C in argon flow. The structure and morphology of the composites were characterized by XRD, SEM and TEM. The surface area and pore size distribution were measured by using N_2 adsorption/desorption curves. The electrochemical performance of the $Li_2Mg_xFe_{1-x}SiO_4$-C composites was evaluated by Galvanostatic cycling against metallic lithium anode, electrochemical impedance spectroscopy, and cyclic voltammetry. $Li_2Mg_{0.01}Fe_{0.99}SiO_4$-C sample shows a capacity of ˜278 mAh/g (at C/30 rate in the 1.5-4.6 V voltage window) with an excellent rate capability and stability, compared to the other samples. We attribute this observation to its higher surface area, enhanced electronic conductivity and higher lithium ion diffusion coefficient.

Ajay Kumar
Wayne State University

Date submitted: 07 Nov 2016 Electronic form version 1.4