Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Ionic and Electronic Conductivity of Poly(Ionic Liquid) - Gold-Nanoparticle Composites[1] MILLICENT FIRESTONE, SUNGWON LEE, SOENKE SEIFERT, Argonne National Laboratory — In this work we describe the single-step synthesis of a robust, self-supporting gold nanoparticle - ionic liquid-derived polymer composite and evaluate its transport properties. Specifically, a gold nanoparticle-containing ionic liquid-derived polymer is synthesized in a single step by UV irradiation of a metal ion precursor-doped, self-assembled d*i*alkylimidazolium-based ionic liquid. The as-synthesized gold nanoparticle-IL composite prepared with 16 % (w/w) water adopts a hexagonal perforated lamellar structure. The conductivity of self-supporting no-gold and gold nanoparticle-ionic liquid-derived polymer composites was characterized using electrochemical impedance spectroscopy (EIS). The dispersion curves shifts towards the low frequency region with increasing Au nanoparticle content. The near overlap of the no-Au nanoparticle composition and the lowest Au nanoparticle containing polymer suggest that at low Au nanoparticle content the transport remains unchanged and is primarily ionic conduction and matrix mediated. Samples prepared at the highest Au nanoparticle show two component transport. The electronic transport may be attributed to the increased number density and filling fraction of the gold nanoparticles within the hexagonally arranged pores of the composite.

[1]This work was performed under the auspices of the Office of Basic Energy Sciences, Division of Materials Sciences, United States Department of Energy, under contract No. DE-AC02-06CH11357.

Millicent Firestone
Argonne National Laboratroy

Date submitted: 17 Nov 2009 Electronic form version 1.4