Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Synthesis of Low Density Metallic Nanowire Network[1] EDWARD BURKS, CHAD FLORES, DUSTIN GILBERT, KAI LIU, University of California, Davis CA 95618, THOMAS FELTER, Sandia National Laboratory, Livermore CA 94551, SUPAKIT CHARNVANICHBORIKARN, SERGEI KUCHEYEV, JEFFERY COLVIN, Lawrence Livermore National Laboratory, Livermore CA 94551 — Highly porous metallic nanostructures have been shown to possess interesting thermal, electrical and mechanical properties due in part to their high surface areas and low densities. In this work, ion track-etched membranes were used as a template for electrodeposition to realize a low density interconnected copper nanowire network. Polycarbonate membranes (3-6 microns thick) were first irradiated with energetic Xe^{6+} ions at normal incidence and multiple 45 degree azimuthal angles. The total irradiation density was $2x10^9$ tracks/cm^2. Following a UV/ozone treatment, NaOH was used to preferentially etch the latent tracks of ion damage, creating intersecting nanopores in the polycarbonate matrix. A thin metal layer was then sputtered onto one side of the now-porous membrane to be used as a working electrode. Selected metals such as Cu and Co were then electrodeposited from a sulfate electrolyte into the pores, filling the membrane with an interconnected wire network. The polycarbonate membrane was then folded onto itself several times, and dichloromethane was used to dissolve away the polycarbonate. So far densities as low as 40mg/cm^3 have been achieved. Structural and magnetic properties of such networks have been investigated.

[1]This work has been supported by DTRA #BRCALL08-Per3-C-2-0006, and in part by NSF DMR-1008791.

Edward Burks
University of California, Davis 95618

Date submitted: 17 Nov 2012 Electronic form version 1.4