Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Magnetoresistance of Gd doped Carbon films ERIK HELGREN, UC Berkeley, LI ZENG, UCSD, C. RONNING, U. Gottingen, H. ZUTZ, J. AGER, LBNL, F. HELLMAN, UC Berkeley — The rare earth dopant Gd was introduced into amorphous carbon ($a-$C) by two quite different techniques; mass selected ion beam deposition (MSIBD) of tetrahedral amorphous carbon (ta-C) followed by Gd implantation and magnetron co-sputtering of Gd and C targets. Raman, RBS and TEM characterization indicate the films are metastable. Films prepared by sputtering ($a-\mathrm{Gd}_x\mathrm{C}_{1-x}$ x=4.2 $\sim$15.6 at.%) have a spin-glass freezing with a temperature which (2-6K) scales with Gd concentration. Films prepared by MSIBD followed by ion implantation (taC:Gd_x, x=4, 7, 13 at.%) show no freezing and a paramagnetic Curie-Weiss law down to 1.9K. Transport measurements show typical doped amorphous semiconductor behavior with very large negative magnetoresistance (MR). The MR of the two types of films are similar, which indicates a universal magnetic moment-carrier interaction in these Gd doped amorphous semiconductor systems. A comparison of these films' MR with other Gd doped semiconductors such as $a-\mathrm{Gd}_x\mathrm{Si}$ and $a-\mathrm{Gd}_x\mathrm{Ge}$ will be discussed. The MR properties of this type of thin film material indicate the importance of the local materials structure and the consequence of the electron screening effects.

Erik Helgren
UC Berkeley

Date submitted: 20 Nov 2006 Electronic form version 1.4