Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Positive and Negative magnetoresistance of semiconduting Fe_x-C_{1-x}/Si thin film XIAOZHONG ZHANG, LIHUA WU, CAIHUA WAN, XILI GAO, Department of Materials Science and Engineering, Tsinghua University, Beijing, China — We synthesized amorphous C film with thickness of 60-80 nm on n-type Si (100) substrate by pulsed laser ablation. When magnetic field is applied perpendicular to the film plane, the C/Si sample shows a positive MR of 40% at room temperature and 5T. This MR is anisotropic and is mainly attributed to the Si substrate. Addition Fe into carbon film enhances the MR and distribution of Fe in carbon film affects the MR sensitivity, i.e. when we distributed Fe into some special positions, the MR of Fe-C/Si sample can reach 30% at H=300 Oe. At bias of 0.4V Fe-C/Si sample shows a linear MR-T relationship at 40-160K and H>1T. At negative bias the MR at low temperature can be positive or negative depending on the direction of magnetic field applied. In addition, the Fe-C/Si films also show some other novel physical properties, such as giant electroresistance, photoconductivity, and gas pressure sensitivity. Study of Fe-C/Si nanostructures, which have characters of multifunctional and simple structure, may shed a light on discovery of new spintronic material.

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Date submitted: 16 Nov 2009 Electronic form version 1.4