Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Novel nanopattern assisted Mn-implanted Ge for spintronic applications JINGJING CHEN, UCLA, Department of Electrical Engineer-Device Research Laboratory (DRL), KOS GALATSIS, UCLA-DRL, KANG WANG, UCLA-DRL, UCLA-DRL TEAM — Mn-Ge is one of the most promising Diluted Magnetic Semiconductors (DMS) materials as reports indicate room temperature ferromagnetism. Our investigation focuses on fabricating Mn-Ge via novel diblock copolymer patterning methods to control Mn implantation within a Ge lattice. We foresee such methods could enable consistent tailoring of Mn-Ge magnetic properties by improving uniform solubility of Mn in Ge, along with decreasing defects. Sample fabrication is based on a 20nm-scale periodic nanodot patterning Ge substrate. Ion-implantation was performed with Mn at 40KeV and with a dose of $4.0\times10^{14}/\mathrm{cm}^2$ then annealed at 400-700 $^\circ$C. Material characterization included XRD, SEM and TEM. XRD detected the presence of Mn_5Ge_3 and $Mn_{11}Ge_8$phase, which is theoretical known to have a Tc near room temperature. Ferromagnetic hysteresis loops were obtained at 5K using a SQUID magnetometer ranging from -5 to 5 kOe. Samples at various annealing temperatures showed the saturation magnetization reaches an optimum value at 450 $^\circ$C. The difference in the temperature-dependent remnant magnetization between the implanted n-type and p-type Ge is also observed.

JingJing Chen
UCLA, Department of Electrical Engineer-Device Research Laboratory (DRL)

Date submitted: 06 Dec 2005 Electronic form version 1.4