Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Ge:Mn Dilute Magnetic Semiconductor LAILA OBIED, Brock University, SJORED ROORDA, University of Montreal, DAVID CRANDLES, Brock University — This work aims to develop Ge:Mn dilute magnetic semiconductor and study the fundamental origin of ferromagnetism in this system. Using ion implantation at 77 K, a single crystal Ge wafer was doped with magnetic Mn ions. The implantation was done at ion energy of 4.76 MeV with a fluence of 2 x 10^{16} ion/cm^2. X-ray diffraction (XRD) of the as-implanted sample showed that the implanted layer was amorphous. Therefore, different samples were annealed at 200 °C, 330 °C and 600 °C in a tube furnace to achieve a solid phase epitaxial regrowth of the implanted layer. XRD of the sample annealed at 330 °C for 33 hours showed a polycrystalline layer. The depth profile of Mn in the as-implanted sample and the post-annealed sample at 330 °C was determined using secondary ion mass spectroscopy (SIMS) and it was found that some Mn diffused to the surface during the annealing. XRD of the sample annealed at 600 °C for 35 minute showed peaks corresponding to an unknown phase in addition to peaks from amorphous and polycrystalline Ge. The sample annealed at 200 °C for 168 hour showed no evidence of solid phase epitaxy. A SQUID was used to measure the magnetic properties of all samples. At low temperature, the as-implanted sample showed a paramagnetic behaviour. A magnetic hysteresis at 5K and up to 200K was observed for the samples annealed at 330 °C and 200 °C. The 600 °C annealed sample showed no ferromagnetic response and a significant reduction in the paramagnetic response at low temperature compared to the as-implanted sample.

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Date submitted: 11 Nov 2014 Electronic form version 1.4