Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Silicon LEDs fabricated using high fluence carbon ion implantation into heated silicon targets[1] SARAH PURDY, JOHN R. MCLEOD, University of Saskatchewan, HIMANSHU RAI, India Institute of Technology, Patna, ANDREW KNIGHTS, McMaster University, MICHAEL BRADLEY, University of Saskatchewan — Fabrication of silicon compatible light emitting diodes (LEDs) is a major goal for modern integrated circuit designers. Ion implantation is a materials processing technique that can be used to engineer materials for this application, by making small to large changes in the stoichiometry at the surface or subsurface of a material. In this study carbon ions were implanted at 20 keV and fluences of 3, 5, 7 and 10 x10^{16} ions/cm^2 into silicon wafers which were maintained at 400 °C during the implantation process. The implanted wafers were then annealed at 1000 °C in flowing nitrogen for 1h. FTIR was used to confirm the formation of SiC. The electronic structure of the implanted and annealed wafers was probed using X-Ray absorption spectroscopy at the silicon L2,3-edge. After treatment, physical vapor deposition was used to apply metal contacts onto the wafers: a semi-transparent Schottky contact (25nm Au) on the implanted surface, and an Ohmic contact (150nm Al) on the back of the wafer. The current-voltage curves and light emission spectra of the resulting Schottky LEDs were collected using a water-cooled electroluminescence testing system. The fabricated LEDs showed turn-on voltages of $\sim$ 2-3V, and the emission spectra showed a broad luminescence band in the orange to infrared (550-900nm) region. The devices are bright, broadband emitters, easily visible to the naked eye and represent one prototype silicon photonics device architecture.

[1]Canada Foundation for Innovation, NSERC discovery grant.

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Date submitted: 15 Nov 2013 Electronic form version 1.4