

Abstract Submitted
for the TSF07 Meeting of
The American Physical Society

Ferromagnetism in Mn-implanted Ge and epitaxial GeC¹

SAMARESH GUCHHAIT, JOHN MARKERT, Department of Physics, The University of Texas at Austin, MUSTAFA JAMIL, SANJAY BANERJEE, Department of ECE, The University of Texas at Austin — 20 keV energy Mn ions were implanted in two samples: 1) bulk Ge (100) and 2) a 250 nm thick epitaxial GeC film, grown on a Si (100) wafer. The GeC thin film was grown by UHV chemical vapor deposition using a mixture of germane (GeH_4) and methylgermane (CH_3GeH_3) gases and contains less than 1% carbon. X-ray diffraction data shows a single crystal phase for the GeC film, and the surface rms roughness is about 0.3 nm, measured with AFM. The Mn implant dose was $1.1 \times 10^{16}/\text{cm}^2$ at a temperature of 300°C for both samples. For this relatively low energy Mn ion implant, the range is about 17 nm and the straggle is about 9 nm. A SQUID magnetometer study shows ferromagnetism in both samples. While the Curie temperature for both samples is about 180 K, the in-plane saturated magnetic moment per unit area for the first sample is about $2.2 \times 10^{-5} \text{emu}/\text{cm}^2$ and that for the second sample is about $3.0 \times 10^{-5} \text{emu}/\text{cm}^2$. These results show clear enhancement of magnetic properties of the Mn-implanted GeC thin film over the identically implanted Ge layer due to the presence of a small amount of carbon.

¹This work was supported by SWAN and NSF DMR 0605828.

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Date submitted: 28 Sep 2007

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