Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Structural and magnetic properties of Fe/MgO/Ge(100) heterostructures and Fe/MgO/Fe(100) magnetic tunnel junctions YUEH-FENG CHIANG, KYLE PI, YAN LI, ROLAND KAWAKAMI, University of California Riverside — MgO is one of the most attractive materials for spintronic devices due to a novel spin filtering effect that dramatically increases spin polarization. We utilize molecule beam epitaxy (MBE) to synthesize ferromagnet (FM)/MgO/semiconductor heterostructures for efficient spin injection and detection in Si, Ge and GaAs lateral devices and MgO-based magnetic tunnel junctions (MTJs) for MRAM applications. Initial studies have focused on optimizing the growth of Fe/MgO/Ge(100) heterostructures and Fe/MgO/Fe MTJs and investigating their magnetic properties. Results indicate high-quality layer-by-layer growth with roughness at the atomic scale. *In situ* reflection high energy electron diffraction (RHEED) is utilized for investigating surface roughness during growth. We observe streaky RHEED patterns and intensity oscillations for the homoepitaxial growth of Ge on Ge(100) at 370^oC, which indicates an atomically flat Ge buffer layer. Epitaxial MgO layers grown on top of the Ge buffer at room temperature also showed streaky RHEED patterns and atomic force microscopy (AFM) images revealed the rms roughness to be 0.2 nm ($\sim$1 atomic layer) for a 3 nm thick MgO film. High remanance and small coercive field have been observed in epitaxial Fe (5nm)/MgO(3nm)/Ge(100) heterostructures via magneto-optic Kerr effect (MOKE) illustrating good magnetic properties.

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Date submitted: 05 Dec 2005 Electronic form version 1.4