Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Optical Properties and ESR defects of amorphous GeTe, Sb_2Te_3 and $Ge_2Sb_2Te_5$[1] TONG JU, JARED OLSON, JANICA WHITAKER, JOHN VINER, HENG LI, P. CRAIG TAYLOR, University of Utah, Department of Physics — Amorphous films, which are based on mixtures of GeTe and Sb_2Te_3,are used in re-writeable, digital versatile discs(DVD+RW). The most commonly used composition is $Ge_2Sb_2Te_5$. We use electron spin resonance (ESR) and photothermal deflection spectroscopy(PDS) experiments to characterize the amorphous films of the three compositions GeTe, Sb_2Te_3 and $Ge_2Sb_2Te_5$. In $Ge_2Sb_2Te_5$ thin films with large concentrations of oxygen impurities, an ESR signal exists without any optical excitation. The signal is probably due to a singly or three-fold coordinated Te. The spin density from this center is around 2×10^{19} cm^{-3}. We also observe a sharp feature due to E′ centers (three-fold-coordinated Si bonded to 3 oxygen atoms) at the interface between the SiO_2substrate and the sample. The signal related to Te is greatly reduced in the films made with lower concentrations of oxygen impurities. In these films we observe an additional ESR signal that appears in GeTe, $Ge_2Sb_2Te_5$,and Sb_2Te_3. Since this signal scales with the number of surfaces, we attribute it to a defect in an oxide of Te on the surface. PDS measurements show that the optical band gaps depend on the oxygen concentrations. When the growth rates are slower, the sample contains higher oxygen concentrations, and the optical band gaps are also higher .The optical band gap is around 0.9 eV in films of $Ge_2Sb_2Te_5$containing approximately 10^{19} cm^{-3}oxygen impurities.

[1]Research supported by NSF under grant #DMR-0307594

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Date submitted: 21 Mar 2013 Electronic form version 1.4