Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Crystal structure and superconducvitiy in $BaPbO_3$/$BaBiO_3$ thin films[1] G.W.J. HASSINK, K. MUNAKATA, R.H. HAMMOND, M.R. BEASLEY, Geballe Laboratory for Advanced Materials, Stanford University, Stanford, CA 94305, USA — Thin bilayers of $BaPbO_3$ and $BaBiO_3$ were grown on $SrTiO_3$ by e-beam evaporation in the hope of testing the proximity effect route to high T_c superconductivity suggested by Kivelson et al [Phys.Rev.B 78, 094509]. X-ray diffraction measurements show that the bilayers are single-phase, but fully relaxed. Depth-profiling by XPS showed that for a deposition temperature of 500 °C there is a gradual intermixing of Pb and Bi in the top $BaPbO_3$ layer. This could result in a superconducting Ba(Pb,Bi)O_3 film, but XRD points to well-resolved layers. Superconductivity in these films is BCS-like, with $\xi_{GL}(0) \sim 10$ nm comparable to bulk values. However, the superconductivity was not primarily correlated with the Bi content as determined from surface XPS scans, but by the crystal structure. The superconducting films consistently have a larger unit cell volume, mostly due to larger in-plane lattice constants. This increase coincides with a higher Ba/Pb elemental ratios, which in literature has been linked to the occurrence of the tetragonal form of Ba(Pb,Bi)O_3 [Sol.State.Comm. 60, 897-900]. This larger unit cell may result in a lower tilt angle of the oxygen octahedra, which has a positive influence on the superconductivity [Phys.Rev.B 83, 174512].

[1]Work supported by the AFOSR MURI Contract # FA9550-09-1-0583-P00006.

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Date submitted: 19 Nov 2012 Electronic form version 1.4