Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Thickness Dependence of Electrical and Structural Properties of Tensile Strained Calcium Manganese Oxide Thin Films[1] CACIE HART, ZOEY WARECKI[2], ADEEL CHAUDHRY, NATALIE FERRONE, DAVID HOUSTON, BRIDGET LAWSON, GRACE YONG, RAJESWARI KOLAGANI, Towson University — We have investigated the properties of $CaMnO_{3-\delta}$ thin films epitaxially grown by pulsed laser deposition on lattice mismatched substrates, (100)$LaAlO_3$ and (100)$SrTiO_3$, leading to a tensile strain of $\sim$4% and 1.5% respectively. For our films these substrates, thickness dependence of the properties is characteristically different from what has been previously observed in thin films of hole-doped manganites. We observe that the resistivity decreases significantly as the film thickness decreases. The decrease in resistivity is more pronounced in the films on (100)$SrTiO_3$ with the larger lattice mismatch, the resistivity of the thinnest films being about 3 orders of magnitude lower than the of bulk $CaMnO_3$. Thickness dependence of the lattice constants also show deviations from the behavior expected from strain relaxation. These results suggest a coupling between tensile strain and oxygen deficiency consistent with predictions from models based on density functional theory calculations. Our results are relevant for potential catalytic applications of $CaMnO_{3-\delta}$ thin films.

[1]NSF Grant ECCS112856 and Seed Funding from the School of Emerging Technologies
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Date submitted: 06 Nov 2015 Electronic form version 1.4