Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Polarity-induced persistent surface reconstruction in $SrRuO_3$ (111) thin films.[1] WEIMEI XIE, School of Physics, Nanjing University, MOHAMMAD SAGHAYEZHIAN, Dept. of Physics Astronomy, Louisiana State University, M.Q. GU, School of Physics, Nanjing University, HANGWEN GUO, Dept. of Physics Astronomy, Louisiana State University, X.S. WU, School of Physics, Nanjing University, E.W. PLUMMER, JIANDI ZHANG, Dept. of Physics Astronomy, Louisiana State University — The surface structural and electronic properties of $SrRuO_3/SrTiO_3$ (111) as function of the film thickness are investigated. It is found that, though the interface of SRO/STO (111) has no polar mismatch and negligible lattice mismatch, the polar surface of $SrRuO_3$ (111) thin films results in a persistent surface reconstruction. Above 2 unit cells, a $(\sqrt{3} \times \sqrt{3})R30^\circ$ surface reconstruction is observed with both Low energy and reflection high energy electron diffraction. X-ray photoemission spectroscopy shows that the reconstruction is associated with the ordered oxygen vacancies on $SrO_{3-\delta}$ terminated surface to compensate the surface polarity. Post annealing in oxygen/ozone mixture restores the $p(1\times 1)$ surface structure, but results in different surface relaxation and enhances the metallicity thus reducing the thickness of dead layer in this material.

[1]Supported by U.S. DOE under Grant No. DOE DE-SC0002136

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Date submitted: 07 Mar 2017 Electronic form version 1.4