Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Controlling the electronic ground state of Ca2RuO4 thin films with epitaxial strain JACOB RUF, HARI NAIR, YANG LIU, DARRELL SCHLOM, KYLE SHEN, Cornell University — Rapid progress in thin-film synthesis techniques in recent years has enabled unprecedented control over the crystal structure of thin films of correlated quantum materials, via knobs such as epitaxial strain and dimensionality. In favorable circumstances where there is strong coupling between a material's crystal structure and its electronic properties, subtle changes to the former can be used to tune dramatic changes in the latter. Here we employ this general approach to the prototypical layered ruthenate Ca_2RuO_4, showing that the multi-orbital Mott insulating ground state of bulk Ca_2RuO_4 can be suppressed (enhanced) in thin films under biaxial compressive (tensile) strain, grown by molecular-beam epitaxy on $LaAlO_3$ and $NdAlO_3$ ($NdGaO_3$) substrates, respectively. Using a combination of x-ray and electron diffraction together with photoemission spectroscopy and electrical transport measurements, we probe how strain modifies the atomic structure of these strained Ca_2RuO_4 films and elucidate how these modifications redistribute the low-energy spectral weight near the Fermi level. Concomitant strain-dependent changes to the magnetic ordering instabilities in these systems will also be discussed.

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Date submitted: 11 Nov 2016 Electronic form version 1.4