Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Aberration Corrected STEM imaging of ferroelectric domain walls in $Ca_3Ru_{2(1-x)}Ti_xO_7$[1] DEBANGSHU MUKHERJEE, SHIMING LEI, The Pennsylvania State University, ZHIQIANG MAO, Tulane University, VENKATRAMAN GOPALAN, NASIM ALEM, The Pennsylvania State University — $Ca_3Ru_2O_7$ is a layered Ruddlesden-Popper oxide which is a strongly correlated metal at room temperature and undergoes a MIT at 48K. Ti doped $Ca_3Ru_2O_7$ is a Mott metal at 300K with the Mott transition temperature increasing with Ti concentration (90K at 5% Ti), but without increase in strain due to the similarity in the size of Ti^{4+} and Ru^{4+} cations. The bulk crystals show the presence of domain walls as observed by polarized light microscopy. Aberration-corrected STEM imaging demonstrates the presence of both 90° and 180° domain walls along with domain junctions. EELS was performed at 300K and 77K to measure the Ru $t_{2g} \longrightarrow$ O *2p* hybridization in metallic and insulating ground states. The ferroelectric distortions inside the domains were measured to be isostructural to distortions in hybrid improper ferroelectric $Ca_3Ti_2O_7$. Additionally,as confirmed by STEM imaging the 180° domain walls exist in head-to-head, head-to-tail and tail-to-tail configurations, thus leading to the intriguing possibility of competition between local ferroic dipole moments and a global shielding from the metallic ground state at room temperature.

[1]D.M., S.L., V.G. and N.A. were funded by the Penn State MRSEC, Center for Nanoscale Science, under the award NSF DMR-1420620.

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Date submitted: 11 Nov 2016 Electronic form version 1.4