Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Noncontact Atomic Force Microscopy Study of Surface Structural Transitions and Charge Distribution Modulations on $SrTiO_3$(100) OMUR DAGDEVIREN, GEORG SIMON, KE ZOU, CHARLES AHN, FRED WALKER, ERIC ALTMAN, UDO SCHWARZ, Yale University — The surface structures of $SrTiO_3$ (100) single crystals were examined as a function of annealing time and temperature in either oxygen or ultra-high vacuum (UHV) using noncontact atomic force microscopy (NC-AFM), Auger electron spectroscopy (AES), and low-energy electron diffraction (LEED). Samples were subsequently analyzed for the effect the modulation of their charge distribution had on their surface potential. It was found that the evolution of the surface roughness, termination, and reconstruction depends crucially on the preparation scheme. For example, transitions from (1x1) termination to an intermediate c(4x2) reconstruction to ultimately a (sqrt(13) x sqrt(13))-R33.7surface were observed for annealing in oxygen. In UHV, the inverse transition occurred and was accompanied by an increase in surface Sr while the surface oxygen content decreased. Complementary NC-AFM measurements showed a non-monotonic trend for surface roughness with annealing temperature, which is explained by electrostatic modulations of the surface potential caused by increasing oxygen depletion. This is further corroborated by experiments in which the apparent roughness tracked in NC-AFM could be correlated with changes in the surface charge distribution.

Omur Dagdeviren
Yale University

Date submitted: 05 Nov 2015 Electronic form version 1.4