Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Controllable modification of fractured Nb-doped $SrTiO_3$ surfaces[1]

NATHAN P. GUISINGER, Center for Nanoscale Materials, Argonne National Laboratory, TEYU CHIEN, Advanced Photon Source, Argonne National Laboratory, TIFFANY S. SANTOS, MATTHIAS BODE, Center for Nanoscale Materials, Argonne National Laboratory, JOHN W. FREELAND, Advanced Photon Source, Argonne National Laboratory — Nano-scale surface modification of a fractured Nb-doped $SrTiO_3$(Nb:STO) surface is demonstrated in a controlled way using scanning tunneling microscopy. It is revealed with high-resolution images that by fracturing Nb:STO at low temperature, about 50 % of SrO adatoms are randomly distributed on large (>500 nm) TiO_2 terminated terraces. By applying positive voltage pulses with appropriate bias and pulse duration, holes can be created with desired width and depth. By applying negative bias, the hole can be partially refilled from the transfer of adsorbates on the tip. The change of dI/dV contrast when creating/refilling the hole is consistent with the model of exposure/covering of the underlying TiO_2 layer by removal/deposition of SrO. This entire modification process can be explained by a surface atom manipulation mechanism.

[1]Use of the Center for Nanoscale Materials was supported by the U. S. Department of Energy, Office of Science, Office of Basic Energy Sciences, under Contract No. DE-AC02-06CH11357.

Teyu Chien
Advanced Photon Source, Argonne National Laboratory

Date submitted: 14 Dec 2009 Electronic form version 1.4