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Oxygen deficiency on the p(1x1) structure of $SrTiO_3$ (001) surface[1] LINA CHEN, ZHAOLIANG LIAO, VON BRAUN NASCIMENTO, YI LI, A.C. ANTONY, E.W. PLUMMER, JIANDI ZHANG, Department of Physics and Astronomy, Louisiana State University, LA, 70810 USA — $SrTiO_3$(STO) is one of the most common substractes used for epitaxial film growth of oxide materials. However, the structure and stoichiometry of STO are still unclear even thought they may dictate the interface properties. We have studied the STO(001) surface structure by Low Energy Electron Diffraction(LEED) and angle-resolved X-ray Photoelectron Spectroscopy (AR-XPS). The unreconstructued p(1x1) STO(001) surface terminated with TiO_2 layer is obtained by simple chemical etching which is always accompanied by oxygen deficiency. Both LEED and AR-XPS results suggest that the surface has a considerable oxygen deficiency, but LEED I(V) analysis indicates the existence of more oxygen vacancies than that from AP-XPS results. The structureal analysis indicates a surface polarization due to a surface buckling combined with oxygen deficiency, which is comsistent with recent surface x-ray scattering results [1] with important implications on surface ferroelectric phenomena in STO. The annealing effect of the as-etched surface in oxygen atmosphere on surface oxgen deficiency as well as reconstruction will also be disussed.

[1] R. Herger et al., Phys. Rev. Lett. 98, 076102(2007).

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