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Origin of Modified Interface Dielectric Properties in BFO Thin Films[1] ALBINA BORISEVICH, HYE JUNG CHANG, Oak Ridge National Laboratory, MARK HUIJBEN, University of Twente, MARK OXLEY, SATOSHI OKAMOTO, Oak Ridge National Laboratory, MANISH NIRANJAN, JOHN BURTON, EVGENY TSYMBAL, University of Nebraska Lincoln, YING HAO CHU, PU YU, RAMAMOORTHY RAMESH, University of California Berkeley, SERGEI KALININ, STEPHEN PENNYCOOK, Oak Ridge National Laboratory — $BiFeO_3$ - $La_{0.7}Sr_{0.3}MnO_3$ (BFO-LSMO) interfaces were investigated by high-resolution scanning transmission electron microscopy (STEM) revealing a local suppression of the octahedral tilts and local increase of the out-of-plane lattice parameter. The combination of direct structural mapping using bright field and annular dark field images with electron energy loss spectroscopy (EELS) was used to correlate the atomic structure, polarization, strain fields and dielectric behavior locally on the atomic level. EELS compositional mapping at the interfaces used principal component analysis combined with neural network interpolation. In the low loss energy region the BFO side of the interface could not be identified with BFO, LSMO or STO ($SrTiO_3$), suggesting that the first 2 nm of BFO has modified dielectric properties. First principles calculations show that the observed suppression of octahedral tilts results in a decreasing BFO band gap or possibly even metallic behavior.

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