Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Order Parameter Interaction at Interfaces and Domain Walls in a BiFeO3 Thin Film[1] YOUNG-MIN KIM, MARK OXLEY, Oak Ridge National Laboratory, ANNA MOROZOVSKA, EUGENE ELISEEV, National Academy of Sciences of Ukraine, PU YU, University of California Berkeley, YING-HAO CHU, National Chiao Tung University, RAMAMOORTHY RAMESH, University of California Berkeley, STEPHEN PENNYCOOK, SERGEI KALININ, ALBINA BORISEVICH, Oak Ridge National Laboratory — Atomic scale studies of the different structural, electronic, and chemical order parameters at domain walls and interfaces are vital for optimization and design of the ferroelectric-based thin film devices. In this study, we use quantitative scanning transmission electron microscopy (STEM) combined with electron energy loss spectroscopy to study atomic-scale phenomena in a multiferroic thin film heterostructures of $BiFeO_3$ (BFO) epitaxially grown on (La,Sr)MnO_3 (LSMO) layer on a $SrTiO_3$ (STO) substrate. We find that charged and uncharged domain walls, as well as interfaces to domain of different polarity, have distinct structural signatures. Charged domain walls are associated with local lattice expansion, suggesting segregation of oxygen vacancies; uncharged domain walls show increased Debye-Waller factors for Bi, suggesting structural frustration. At the LSMO/BFO interface, downward polarization direction is associated with change in local valence state of near-interface Mn cations and lattice expansion.

[1]Research supported by DOE-BES Materials Sciences and Engineering Division and through a user project supported by ORNL's ShaRE User Program.

Albina Borisevich
Oak Ridge National Laboratory

Date submitted: 12 Dec 2012 Electronic form version 1.4