Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Nonvolatile Three-Step Ferroelectric Switching in Tensile Strained $BiFeO_3$ Thin Films JIN HONG LEE, KANGHYUN CHU, KWANG-EUN KIM, CHAN-HO YANG, Department of Physics, KAIST, Daejeon 305-701, Republic of Korea — Misfit strain has been one of key control parameters to improve the magnetoelectric coupling between ferroelectricity and magnetism in multiferroic epitaxial thin films. Lately, it was discovered that a bulk-like phase of multiferroic bismuth ferrite ($BiFeO_3$), through compressive or tensile misfit strain, can be transformed into a highly-elongated tetragonal-like phase [1-3] or an orthorhombic phase [4], respectively, thereby offering new chances into magnetoelectric applications. Although the heteroepitaxial misfit strains via (001) interfaces have been intensively studied, strain effects arising from the other directional interfaces such as (110) have not been studied much. In this talk, we present the uniaxial-tensile-strain effects on the (110) oriented $BiFeO_3$ thin films. Our detailed piezoresponse force microscopy analysis, X-ray reciprocal space mapping, and Landau free energy modeling give strong evidences of electrically switchable, non-volatile, three out-of-plane polarization states. These findings provide useful implications for a new type of magnetoelectric devices based on phase competition.

[1] H. Bea *et al.*, Phys. Rev. Lett. **102**, 217603 (2009).
[2] R. J. Zeches *et al.*, Science **326**, 977 (2009).
[3] K. T. Ko *et al.*, Nat. Commun. **2**, 567 (2011).
[4] J. C. Yang *et al.*, Phys. Rev. Lett. **109**, 247606 (2012).

Jin Hong Lee
Department of Physics, KAIST, Daejeon 305-701, Republic of Korea

Date submitted: 15 Nov 2013 Electronic form version 1.4