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Size Effect in Ferroelectric $BiFeO_3$ Films T. ZHAO, Univ. of California, Berkeley, F. ZAVALICHE, L. MOHADDES-ARDABILI, S.Y. YANG, Univ. of California, Berkeley; Univ. of Maryland, College Park, Y.H. CHU, Univ. of California, Berkeley; National Tsing-Hua University, Hsinchu, Taiwan , Q. ZHAN, H. ZHENG, E. REILLY, Univ. of California, Berkeley, D.G. SCHLOM, Pennsylvania State University, R. RAMESH, Univ. of California, Berkeley — $BiFeO_3$ (BFO) has recently attracted attention because it is considered as a promising candidate for the lead-free ferroelectric memory cells and/or piezoelectric sensors and actuators. However the understanding of ferroelectricity of BFO is still limited, especially when the vertical and lateral dimensions decrease in thin films. We are studying the ferroelectric and piezoelectric responses of epitaxial BFO films grown by pulsed laser deposition on single crystal $SrTiO_3$(STO) (100,110, 111 orientations) as well as STO/Si. The epitaxy of the films were confirmed by TEM and XRD. The electric properties were characterized by polarization hysteresis, pulsed polarization and piezoelectric force microscopy (PFM) measurements. The polarization in BFO is along the (111) direction of its rhombohedrally distorted perovskite structure which is different from the (001)-polarization in tetragonal PZT. We observe a systematic decrease in piezoresponse as the thickness is decreased from 400nm down to 30nm. We will present the results of this systematic study in this paper. This work is supported by an ONR-MURI.

T. Zhao
Univ. of California, Berkeley

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