# Growth mechanism and ferroelectric domain structure study on epitaxial $BiFeO_3$ film grown on $(La_{0.3}Sr_{0.7})(Al_{0.65}Ta_{0.35})O_3$

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$BiFeO_3$ (BFO) film is epitaxially grown on the $(La_{0.3}Sr_{0.7})(Al_{0.65}Ta_{0.35})O_3$ (LSAT) substrates to investigate lattice mismatch effect on domain structure and lattice strain status within the BFO film. Atomic resolution scanning transmission electron microscope image, [Fig. 1(a)] selected area electron diffraction (SAED) pattern, and X-ray reciprocal space mapping (XRSM) clearly reveal that the lattice strain originating from the lattice mismatch between BFO and LSAT is relaxed by causing misfit dislocations in BFO film. [Fig. 1(a)] The SAED and XRSM data indicate crystal structure of BFO film is rhombohedral with space group of *R3c* assigned rhombohedral specific diffraction spots. [1] In particular, XRSM acquired along two different in-plane orientations reveal that BFO layer consists of two different domains that were 90° off each other around surface normal orientation. Atomistic model based on the orientation relation found by SAED and XRSM shows the domain structure is consistent with so called 71° ferroelectric domain reported previously. [Fig. 1(b)] The lattice mismatch of ~2.8% calculated based on the epitaxial relation is proposed to be too large to be stored as elastic strain within BFO layer.

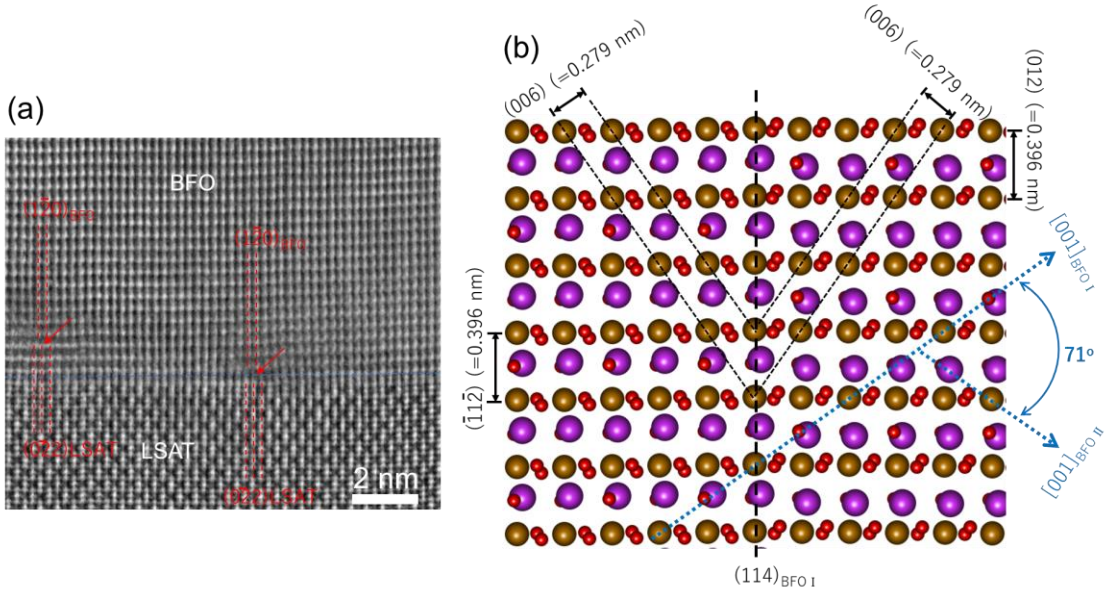


Figure 1(a) A cross-sectional HAADF-STEM image at the BFO/LSAT interface along $[011]_{LSAT}$ zone axis, (b) (a) An atomistic model that shows ferroelectric orientation relation.

References: [1] I.-T. Bae & H. Naganuma, APEX **8**, 031501 (2015).