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Electrically Controllable Magnetism in Strained $BiFeO_3$ Thin Films QING HE, University of California, Berkeley, W. LUO, R. RAMESH, UC Berkeley, J.-C. YANG, Y.-H. CHU, National Chiao Tung University, A. SCHOLL, LBNL — multiferroic $BiFeO_3$ (BFO) thin films epitaxial strain can lead to the formation of a mixed phase system – highly distorted rhombohedral (R') and distorted tetragonal (super-tetragonal) (T) phases. Interestingly, this R' phase has been observed to be with enhanced magnetization compare to bulk BFO. Then, in order to investigate the origin of the magnetism in R' phase, synchrotron x-ray absorption, and x-ray (magnetic) circular/linear dichroism have been employed with assistance of spectra simulation and the ferroelectric, antiferromagnetic and ferromagnetic properties of this magnetic R' films have been clearly identified. Surprisingly, enhanced magnetization emerges in (001) plane as soon as a critical DC field is applied to the film in $< 001 >$ direction. The key is that the movement of Fe^{3+} can be controlled by external electric field, which magnifies the effect of Dzyaloshinsky-Moriya interaction to the system, and enlarges the canting magnetic moment of Fe spins. Finally, the direction of the local magnetic moment can be deterministically by external electric field will be demonstrated.

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