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Emergence of 90° Domain Walls in Multiferroic $BiFeO_3$ Thin Film JAN-CHI YANG, YING-HAO CHU, National Chiao Tung University, CHUN-YEN PENG, HSIANG-JUNG CHEN, National Chiao Tung University, LI CHANG, QING HE, RAMAMOORTHY RAMESH, UC Berkeley, CHAO-HUI YEH, HENG-JUI LIU, SHENG-JIE LIAO, PO-WEN CHIU, CHIH-HUNG LAI, National Tsing Hua University — Multiferroics have been a fascinating area for condensed materials research since these materials offer the exciting potential applications that taking advantages of multiple orders. Multiferroic $BiFeO_3$ (BFO) has played a key role in rejuvenating the field after a report of large ferroelectric polarization. Inside this material, domain walls (DWs) of BFO are of great interests. In recent study, room-temperature conductivity at ferroelectric DWs has been observed. In this work, through epitaxial strain, BFO thin films are grown on $NdScO_3$, which provide tensile strain on BFO films, and thus results in orthorhombic-like phase and corresponding periodic 90° DWs. X-ray reciprocal mapping and piezoresponse force microscopy has confirmed the orthorhombic-like and 90° DW structure. The transport behaviors of these natural formed 90° DWs as a function of temperatures and magnetic fields have been probed to understand their fundamental properties. In addition, exchange bias studies and X-ray magnetic dichroism spectromicroscopy have further revealed the magnetic properties in these DWs. Our results show that 90° DW in orthorhombic-like BFO possesses unusual electronic and magnetic behaviors, which are different from that in bulk and might be used for modern electronic devices and nanoelectronic.

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