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Investigation of domain walls in multiferroic $BiFeO_3$ JAN SEIDEL, LANE MARTIN, YING-HAO CHU, QIAN ZHAN, QING HE, Department of Materials Science and Engineering and Department of Physics, UC Berkeley, FENG WANG, Department of Physics, UC Berkeley, RAMAMOORTHY RAMESH, Department of Materials Science and Engineering and Department of Physics, UC Berkeley, AXEL ROTHER, NICOLA SPALDIN, Materials Department, UC Santa Barbara, GUSTAU CATALAN, JAMES SCOTT, Department of Earth Science, University of Cambridge, UK — We present a thorough study of domain walls in multiferroic $BiFeO_3$ thin films using scanning probe methods, transmission electron microscopy, transport measurements coupled with theoretical studies. In rhombohedral $BiFeO_3$, three different domain wall orientations exist, namely 180, 109, and 71 degrees. We find that the domain configurations in thin films are strongly dependent on the processing conditions. Here we investigate electrical and structural properties of all three varieties. Atomic resolution TEM studies were used to reveal the structure across the domain walls, with a specific focus on 109°. We observe that the changed crystallographic structure in domain walls gives rise to a change in local properties. From the investigation of individual domain walls we also infer their relation to changed macroscopic properties in thin films. This work is supported by the US DOE, ONR MURI, NSF Chemical Bonding Center program, and the Alexander von Humboldt Foundation.

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