

Abstract Submitted
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Magnetic and structural properties of BiFeO₃ thin films grown epitaxially on SrTiO₃/Si substrates¹ NIKOLETA THEODOROPOULOU, DANIEL CURRIE, RYAN LAUGHLIN, ROCIO CONTRERAS-GUERERRO, ARUNA DEDIGAMA, WEERASINGHE PRIYANTHA, RAVINDRANATH DROOPAD, Texas State University, PENG GAO, XIAOQING PAN, University of Michigan — The integration of oxides with semiconductors is important for the technological advancement of the next generation electronics. Concomitant ferroelectric and antiferromagnetic (AF) behavior is demonstrated in single crystal BiFeO₃ (BFO) films grown on 20 nm SrTiO₃ (STO) virtual substrates on Si (100) using MBE. Commensurate STO thin films are grown on Si in an oxide MBE chamber by co-deposition of Sr, Ti and molecular O₂. The STO/Si films are used as a virtual substrate for MBE deposition of BFO without breaking vacuum. The RHEED image of BFO shows a 2-D growth front with a 6-fold surface reconstruction under optimized conditions. Cross-sectional TEM confirms the high crystallinity of the films and shows sharp, atomically flat interfaces. The SADP reveals that BFO grows in a distorted rhombohedral crystal structure. XRD does not show formation of second phases and is consistent with the TEM and SADP results. The BFO films show AF behavior with a Neel temperature that exceeds 350 K and with a residual ferromagnetic behavior that decreases with film thickness. The saturation magnetization for a 20 nm film was 180 emu/cm³. The ferroelectric behavior of the films was verified using Piezoresponse Force Microscopy.

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