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In-situ x-ray diffraction studies of the epitaxial growth of $BaTiO_3$ on $SrTiO_3$ S.J. CALLORI, J. SINSHEIMER, B. BEIN, Dept. of Physics and Astronomy, Stony Brook University, P.V. CHINTA, A. ASHRAFI, R. HEADRICK, Dept. of Physics, University of Vermont, M. DAWBER, Dept. of Physics and Astronomy, Stony Brook University — When $BaTiO_3$ is grown on $SrTiO_3$ it is subject to a large epitaxial compressive strain, which means that it can actually be ferroelectric during growth. Therefore, screening provided by a bottom electrode is important in realizing fully strained $BaTiO_3$ thin films. To fully understand the role of strain, electrical boundary conditions and deposition technique in forming highly strained ferroelectric thin films, we grew thin films of $BaTiO_3$ on $SrTiO_3$, both with and without $SrRuO_3$ bottom electrodes, using both off axis RF magnetron sputtering and pulsed laser deposition, while the growth was monitored by in-situ x-ray diffraction at X21 at the National Synchrotron Light Source. Out-of-plane and in-plane lattice parameters and x-ray reflectivity were measured during growth, allowing changes in strain and tetragonality of the films to be correlated with changes in growth modes. The presence or absence of an electrode impacted the relaxation and tetragonality of the films differently for the two different growth techniques. Information gained by these synchrotron experiments provides important guidance for the growth of high quality ferroelectric thin films and superlattices.

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