Growth, crystal structure, and properties of epitaxial $BiScO_3$ thin films

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Abstract: Epitaxial thin films of $BiScO_3$-a compound thermodynamically unstable under ambient conditions-were grown on $BiFeO_3$-buffered $SrTiO_3$ substrates. X-ray diffraction confirmed the reasonable crystalline quality of the films with a full width at half maximum of 0.58° in omega (004 reflection), 0.80° in phi (222 reflection), and 0.28° in theta. The epitaxial thin films of $BiScO_3$ on $SrTiO_3$ retain the principal structural features of bulk $BiScO_3$ (i.e., octahedral tilting and the pattern of Bi displacements) that give rise to a pseudo-orthorhombic unit cell $2\sqrt{2}a_c \times \sqrt{2}a_c \times 4a_c$ ($a_c \approx 4$ Å refers to the lattice parameter of an ideal cubic perovskite). Films grown on {100} substrates adopt the bulk monoclinic structure, whereas films on the (110) substrates appear to exhibit an orthorhombic symmetry. The dielectric permittivities were modest (approximate to 30) with low loss tangents (<1% at low fields); no maxima were observed over a temperature range of -200 to +350°C. There is no evidence of significant hysteresis (either ferroelectric or antiferroelectric) at room temperature up to the breakdown strength of the films. (C) 2008 American Institute of Physics.