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Strain Effects in Barium Strontium Titanate Films for Tunable Microwave Applications LISA ALLDREDGE, WONTAE CHANG, Naval Research Laboratory, JOSEPH WOICIK, National Institute of Standards and Technology, STEVEN KIRCHOEFER, JEFFREY POND, Naval Research Laboratory — Recently, it has been demonstrated that control of lattice structure can improve dielectric tuning in epitaxial ferroelectric (FE) films. Understanding the coupling of strain and lattice structure to the dielectric properties is important for FE-based tunable microwave applications. $Ba_xSr_{1-x}TiO_3$ films on (001) MgO substrates were grown by sputter deposition with c<a and c>a tetragonal distortions, where a and c are the in-plane and out-of-plane lattice parameters, respectively. The dielectric properties were significantly affected by the type of lattice distortion and by the direction of strain-induced permanent polarization if present. Ti K-edge x-ray absorption fine-structure (XAFS) measurements were taken in several orientations. The anisotropy in the spectra with orientation was used to determine the FE phases of the films. The dependence of the in-plane dielectric constant on strain will be discussed in terms of a theoretical model of the phenomenological thermodynamics of the film strain effect.

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