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Biaxial Stress-Induced Domain Wall Motion at Room Temperature in Polycrystalline Lead Zirconium Titanate Thin Films RICARDO ZEDNIK, PAUL MCINTYRE, Stanford University — Wafer curvature methods can be used to impose pure biaxial tensile and compressive stresses on thin-films. This makes it possible to study the isolated effects of biaxial stress on the ferroelastic domains in ultra-fine grained PZT. Electrical measurements, such as capacitance-voltage and polarization-field hysteresis, were conducted as a function of applied stress and complemented with in-situ high resolution synchrotron X-ray diffraction measurements performed at the Stanford Synchrotron Radiation Laboratory. Systematic correlation of synchrotron scattering data with the electrical properties of the films shows that applied biaxial stress results in a marked change in the film's ferroelastic domain populations at room temperature. The large magnitude changes in ferroelectric and dielectric properties of thin film capacitors are consistent with the observed changes in relative volume fractions of the in-plane (a-axis) and out-of-plane (c-axis) oriented tetragonal PZT domains. This fully-reversible effect is symmetric in both tensile and compressive stress states. Our results, obtained from columnar-structure, fiber-textured PZT thin films, will be compared to reported data for ferroelastic domain wall motion in bulk and epitaxial specimens to assess the influence of PZT crystallite size and sample geometry on this phenomenon.

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