The Field Induced e31,f Piezoelectric and Rayleigh Response in Barium Strontium Titanate Thin Films.

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The electric field induced e(31,f) piezoelectric response and tunability of Ba0.7Sr0.3TiO3 (70:30) and Ba0.6Sr0.4TiO3 (60:40) thin films on MgO and silicon was measured. The relative dielectric tunabilities for the 70:30 and 60:40 compositions on MgO were 83% and 70%, respectively, with a dielectric loss of less than 0.011 and 0.004 at 100 kHz. A linear increase in induced piezoelectricity to -3.0 C/m(2) and -1.5 C/m(2) at 110 kV/cm was observed in Ba0.6Sr0.4TiO3 on MgO and Ba0.7Sr0.3TiO3 on Si. Hysteresis in the piezoelectric and dielectric response of the 70:30 composition films was consistent with the positive irreversible dielectric Rayleigh coefficient. Both indicate a ferroelectric contribution to the piezoelectric and dielectric response over 40-80 degrees C above the global paraelectric transition temperature.