

Strain-modulated Piezoelectric and Electrostrictive Nonlinearity in Ferroelectric Thin Films without Active Ferroelastic Domain Walls

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Abstract: In contrast to usual assumptions, it is shown that even when ferroelastic domain walls are inactive or absent, the motion of ferroelectrically active interfaces in ferroelectric materials contributes, at subcoercive electric fields, not only to the polarization but also to the strain. Specifically, in polycrystalline samples, strain coupling between adjacent grains, or mediated through the substrate in thin films, influences both the dielectric and piezoelectric response. The model developed explains the unexpected observation of piezoelectric nonlinearity in films even in cases in which the domain variants' projections are equivalent along the direction of the external driving field.

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