# Thickness-dependent Domain Wall Reorientation in 70/30 Lead Magnesium Niobate- Lead Titanate Thin Films

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Continued reduction in length scales associated with many ferroelectric film-based technologies is contingent on retaining the functional properties as the film thickness is reduced. Epitaxial and polycrystalline lead magnesium niobate-lead titanate (70PMN-30PT) thin films were studied over the thickness range of 100-350nm for the relative contributions to property thickness dependence from interfacial and grain-boundary low permittivity layers. Epitaxial PMN-PT films were grown on $SrRuO_3$/(001)$SrTiO_3$, while polycrystalline films with {001}-Lotgering factors >0.96 were grown on Pt/$TiO_2$/$SiO_2$/Si substrates via chemical solution deposition. Both film types exhibited similar relative permittivities of similar to 300 at high fields at all measured thicknesses with highly crystalline electrode/dielectric interfaces. These results, with the DC-biased and temperature-dependent dielectric characterization, suggest irreversible domain wall mobility is the major contributor to the overall dielectric response and its thickness dependence. In epitaxial films, the irreversible Rayleigh coefficients reduced 85% upon decreasing thickness from 350 to 100nm. The temperature at which a peak in the relative permittivity is observed was the only measured small signal quantity which was more thickness-dependent in polycrystalline than epitaxial films. This is attributed to the relaxor nature present in the films, potentially stabilized by defect concentrations, and/or chemical inhomogeneity. Finally, the effective interfacial layers are found to contribute to the measured thickness dependence in the longitudinal piezoelectric coefficient.