⟨SI-1⟩

{100} 우선 배향된 PMN-PT (70/30) 박막의 유전 및 압전 특성

Characterization of dielectric and piezoelectric properties for the highly {100} fiber textured PMN-PT (70/30) thin films

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Fiber textured {100}-oriented PMN-PT (70/30) films with thicknesses between 0.35 mm and 2.1 mm were prepared using chemical solution processing. The degree of preferred orientation changed little with increasing thickness. It was found that the dielectric constant, remanent polarization, and piezoelectric coefficients (-d31) increased with increasing film thickness. The d31 coefficients of highly {100} oriented PMN-PT films on Pt-coated Si substrates were found to range from -16 to -96 pC/N. Ultraviolet illumination during poling resulted in abnormal aging behaviors and lower overall aging of the films. The initial non-linear aging behavior was attributed to the presence of an internal space charge field that develops from photo-induced charge carriers. As the space charge field decays over time, d31 increases until 450-500 min after poling, at which time d31 remains either constant or declines slightly. Thus, the changes in d31 were limited to 1-2 %/decade 500-600 min after poling.

⟨SI-2⟩

Phenomenological behaviors of fatigue and voltage offsets in PZT thin films

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Although a number of experimental and theoretical contributions have been made concerning the issues of fatigue and imprint, no clear consensus has emerged regarding their origins or potential solutions. The purpose of this research is to investigate aspects of fatigue and imprint which have been observed in recent experimental results, and to define a phenomenological explanation which describes this behavior. In an approach to address these issues we have performed an extensive series of experiments on (111)-textured PZT (Zr/Ti = 30/70, 200 nm) film on Pt electrodes. This is chosen for the present as it is the preferred composition and orientation for non-volatile memories. Electrical measurements include polarization hysteresis, imprint, fatigue, voltage dependent permittivity, leakage current density. All electrical measurements were performed before and after achieving the fatigued and the imprinted states. Results to emphasize include the fact that fatigued samples show larger imprint. In addition, fatigued samples show lower leakage current density after fatigue, in contrast to several reports. Furthermore, coercive field is found to decrease slightly with fatigue, but only in one switching direction. Detail results are discussed in terms of current fatigue and imprint model.