Thickness Dependence of Dielectric Nonlinearity of Lead Zirconate Titanate Films

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Abstract: The first-order reversal curves (FORC) distribution of PbZr(0.52)Ti(0.48)O(3) thin films was characterized as a function of film thickness. It was found that the thickness dependence of the small-field dielectric constant is due primarily to differences in the domain wall contributions to the properties. The irreversible FORC distribution decreased and the switching fields increased as the thickness decreased; this is compatible with reported Rayleigh analyses. The polarization-electric field data and the ac field dependence of the dielectric constant were modeled using the FORC distributions, and were found to give a good fit to the experimental results. Some discrepancies remain in the high-field dielectric constant, probably caused by its definition.