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Domain wall roughness and creep behavior in nanoscale crystalline ferroelectric oxide and polymer films ZHIYONG XIAO, SHASHI PODDAR, STEPHEN DUCHARME, XIA HONG, Department of Physics and Astronomy, University of Nebraska-Lincoln — We have studied the static and dynamic properties of domain wall (DW) in nanoscale crystalline ferroelectric oxide $Pb(Zr,Ti)O_3$ (PZT) and poly(vinylidene-fluoride-trifluorethylene) (PVDF-TrFE) films of 20 to 40 nm thick using piezo-response force microscopy. DW roughness exponent ζ is extracted from the correlation function of DW displacement. At room temperature, ζ of PVDF-TrFE is 0.4 to 0.48, much higher than those obtained on the PZT films (0.2-0.3). Combined with the dynamic studies of the DW creep behavior, this yields an effective dimensionality of 1.5 for PVDF-TrFE films, in sharp contrast to $d_{eff} \sim 2.5$ observed in PZT films. We have also thermally quenched the DWs after heating them at high temperatures. Thermal quench causes significant change in the DW configuration in PZT films with ζ increasing to ~ 0.5 after the films are heated close to the Curie temperature T_C. On the other hand, the DWs in PVDF-TrFE films exhibit very weak temperature dependence. We attribute this distinctly different behavior to the strong anisotropy between in-plane and out-of-plane interaction in PVDF-TrFE, which is absent in PZT.

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