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Nanoscopic studies of ferroelectric domain walls in epitaxial perovskite thin films PATRYCJA PARUCH, THIERRY GIAMARCHI, University of Geneva, THOMAS TYBELL, NUST, JEAN-MARC TRISCONE, University of Geneva — Understanding the behavior of ferroelectric domain walls (DW) is important for applications using multi-domain structures. Microscopic studies of these systems are needed to discriminate between periodic lattice and disorder pinning. Epitaxial perovskite films are an excellent model systems for such studies. Using atomic force microscopy on $PbZr_{0.2}Ti_{0.8}O_3$ thin films we have investigated the static configuration and subcritical dynamics of ferroelectric DW. Measurements of individual nanoscopic domains showed initial nucleation at the AFM tip, followed by radial DW motion. We have demonstrated this motion to be a creep process with a non-linear velocity response to electric fields: $v \sim \exp[-C/E^{\mu}]$. The dynamical exponent μ ranged between 0.5-1 [1,2]. Independent measurements of DW roughness in these films revealed a power law growth of the relative displacements correlation function $B(L) \sim L^{2\zeta}$ at short length scales L, with a wandering exponent $\zeta \sim 0.26$. Together, these results give an effective DW dimensionality of 2.5. These results cannot be explained by lattice pinning, but agree with calculations for two-dimensional elastic interfaces in the presence of random-bond disorder and dipolar interactions.
1. Tybell, PRL **89**, 097601
2. Paruch, cond-mat/0411178

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