

Abstract Submitted  
for the MAR14 Meeting of  
The American Physical Society

**Spatial Variation and Temporal Fluctuation of Domains at Equilibrium in a PbTiO<sub>3</sub>/SrTiO<sub>3</sub> Superlattice** QINGTENG ZHANG, PICE CHEN, MARGARET COSGRIFF, University of Wisconsin-Madison, MOHAMMED YUSUF, Stony-Brook University, ZHONGHOU CAI, ROSS HARDER, Argonne National Laboratory, SARA CALLORI, MATTHEW DAWBER, Stony-Brook University, PAUL EVANS, University of Wisconsin-Madison — The spontaneous polarization of ferroelectric thin films often forms a periodic domain pattern in order to minimize the electrostatic energy. The coherent x-ray scattering pattern of serpentine striped domains in a PbTiO<sub>3</sub>/SrTiO<sub>3</sub> superlattice exhibits a series of intensity speckles arising from the nanoscale disorder of the domain pattern. The detailed variation of the domain pattern in space and time can be measured by observing the decorrelation of the speckles in a series of measurements at varying positions and times. We show here that the serpentine domains do not show repetition of spatial patterns on the order of approximately 1000 domain periods. The temporal fluctuation of the domains is fit by a model that describes similar slow dynamics in jammed soft matter systems. Change of domain structures is observed after repeated excitation by short-duration electric-field pulses. The decorrelation is incomplete following electric pulses that are large enough induce a transition to a uniform polarization state, indicating that the domain pattern regenerated after each pulse is at least partially determined by heterogeneity in the superlattice structure.

Qingteng Zhang  
University of Wisconsin-Madison

Date submitted: 15 Nov 2013

Electronic form version 1.4