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Local Polarization Dynamics and Bias-Induced Phase Transitions in Ferroelectric Relaxors: Time-resolved Spectroscopy and Ergodic Gap Mapping S.V. KALININ, B. RODRIGUEZ, M.P. NIKIFOROV, N. BALKE, S. JESSE, O.S. OVCHINNIKOV, A.A. BOKOV, Z.-G. YE, ORNL TEAM, SIMON FRAZER UNIV. TEAM — Mesoscopic domain structure and dynamics in PMN-PT solis solutions is studied using spatially resolved time- and voltage spectroscopic imaging modes. For compositions close to the MPB, we observe the formation of classical ferroelectric domains with rough self-affine boundaries. In the ergodic phase (PMN and PMN-10PT), the formation of non-classical labyrinthine domain patterns characterized by a single characteristic length scale is observed. The (a) persistence of these patterns well above Tc and (b) the fact that cannot be switched by tip bias suggest that they can be attributed to the frozen polarization component. Spatial variability of polarization relaxation dynamics in PMN-10PT is studied. Local relaxation attributed to the reorientation of polar nanoregions was found to follow stretched exponential dependence, with $\beta \approx 0.4$, much larger than the macroscopic value determined from dielectric spectra ($\beta \approx 0.09$). The spatial inhomogeneity of relaxation time distribution with the presence of 100-200 nm "fast" and "slow" regions is observed. The results are analyzed to map the Vogel-Fulcher temperatures on the nanoscale. The applicability of this technique to map "ergodic gap" distribution on the surface is discussed. Research supported by the Division of Materials Science and Engineering, Basic Energy Sciences, U.S. Department of Energy at Oak Ridge National Laboratory, which is managed by UT-Battelle, LLC.

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