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Optically driven polarization modulation in lead titanate nanolayers probed by ultrafast x-ray diffraction DAN DARANCIANG, Stanford University, HAIDAN WEN, SLAC National Accelerator Laboratory, MATTHEW HIGHLAND, Argonne National Laboratory, NATHANIEL BRANDT, BRADFORD PERKINS, KEITH NELSON, M.I.T., PAUL FUOSS, G. BRIAN STEPHENSON, Argonne National Laboratory, AARON LINDENBERG, Stanford University, SLAC National Accelerator Laboratory — We perform time-resolved x-ray diffraction measurements on ferroelectric thin films of lead titanate (PTO) grown on strontium titanate (STO) and dysprosium scandate (DSO) with 100 ps resolution. Under 400 nm excitation, we observe a shift of the diffraction peak in theta-2theta scans to low Q that mostly recovers in a few nanoseconds, which may be partially associated with carrier screening effects. Surprisingly, rocking curve scans indicate that no domain wall movement accompanies this excitation. We systematically study the dynamics of this structural change as a function of pump fluence, sample temperature and thin film-substrate strain. Notably, we observe in the PTO/STO system that the diffraction peak in theta-2theta scans is dramatically reshaped at 550 degrees C, where the stripe phase dominates. In the PTO/DSO system, which minimizes thin film-substrate strain, weaker perturbations are seen. Controlled measurements with 800 nm excitation produce only step-function jumps in delay scans, which can be attributed to thermal heating effects.

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