Abstract Submitted
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Photoinduced structural dynamics in $BiFeO_3$ thin films studied by ultrafast x-ray diffraction[1] D.A. WALKO, E.M. DUFRESNE, J.H. LEE, J.W. FREELAND, Y. LI, H. WEN, Advanced Photon Source, Argonne National Laboratory, P. CHEN, P.G. EVANS, University of Wisconsin-Madison, C. ADAMO, D.G. SCHLOM, Cornell University, J. IHLEFELD, Sandia National Laboratories — We have used time-resolved x-ray diffraction to study the temporal response of multiferroic $BiFeO_3$ to laser excitation. Above-bandgap light pulses, with 400 nm central wavelength and 50 fs duration, were used to photoexcite 35-nm thick $BiFeO_3$ films grown by molecular beam epitaxy on $SrTiO_3$ (001) substrates. The angular shifts of $BiFeO_3$ Bragg peaks vs. time were recorded with $\sim$100 ps resolution and used to determine the out-of-plane strain in the film. Observed strains range up to several tenths of a percent after excitation and relax on a several-ns timescale. Strains of such magnitude are too large to be explained by thermal expansion alone, but rather appear to be due to screening of the depolarization field by photoexcited carriers. At higher laser fluences, the integrated intensity of the Bragg peak decreases due to transient rearrangement of the atomic lattice on the scale of $\sim$0.1 Å.

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