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Transient grating-induced phase inhomogeneity in FeRh studied by time-resolved hard x-ray nanodiffraction[1] YI ZHU, Argonne National Lab, QINGTENG ZHANG, PICE CHEN, Department of Materials Science and Engineering, University of Wisconsin, Madison, D.A. WALKO, E.M. DUFRESNE, Argonne National Lab, J.U. THIELE, Seagate Technology, E.E. FULLERTON, Department of Electrical and Computer Engineering, University of California, San Diego, ZHONGHOU CAI, Argonne National Lab, P.G. EVANS, Department of Materials Science and Engineering, University of Wisconsin, Madison, HAIDAN WEN, Argonne National Lab — The photo-induced antiferromagnetic to ferromagnetic phase transition of FeRh at room temperature has important technological applications in the magnetic recording industry. This first-order phase transition is accompanied by a large, abrupt lattice expansion. In this study, spatially periodic phase modulation in a FeRh thin film was induced by an optical transient grating; the temporal and spatial evolution of the resulting lattice profile was probed by ultrafast hard x-ray nanodiffraction. We found that the transient grating induced lattice profile deviates from the initial sinusoidal spatial modulation during the recovery process, which allows us to quantitatively measure the in-plane propagation of the phase boundary.

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