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Direct characterization of photo-induced femtosecond lattice dynamics in $BaFe_2As_2$[1] SIMON GERBER, YAN ZHANG, DILING ZHU, NACHUM PLONKA, MING YI, GEORGI L. DAKOWSKI, PATRICK S. KIRCHMANN, ROBERT G. MOORE, MATTHIEU CHOLLET, JAMES M. GLOWNIA, YIPENG FENG, JOSHUA J. TURNER, JUN-SIK LEE, APURVA MEHTA, SLAC National Accelerator Laboratory, HSUEH-HUI KUO, IAN R. FISHER, Stanford University, THOMAS WOLF, Karlsruhe Institute of Technology, YI-DE CHUANG, ZAHID HUSSAIN, Lawrence Berkeley National Laboratory, CHI-CHANG KAO, SLAC National Accelerator Laboratory, KYUNGWAN KIM, Chungbuk National University, ZHI-XUN SHEN, THOMAS P. DEVEREAUX, WEI-SHENG LEE, SLAC National Accelerator Laboratory — $BaFe_2As_2$ exhibits a strong coupling among nematic fluctuations, the spins and the lattice, serving as a playground for an ultrafast control of the electronic properties via optical excitation. Here we use ultrafast x-ray scattering to measure a lattice Bragg peak in photo-excited $BaFe_2As_2$. Ultrafast structural phase transitions do not occur upon excitation with an optical laser pulse, indicating that the change of the crystal structure may not be solely attributed to nematic fluctuations. In addition, an ultrafast increase and oscillation of the Bragg peak intensity is observed. Its frequency is consistent with the coherent excitation of an A_{1g} optical phonon mode, that modulates the Fe-As-Fe bond angle. Thereby, we obtain direct and quantitative access on the bond angle variation.

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