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8.52 Electron-lattice coupling in femtosecond laser excited matter

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Electron-lattice coupling strength governs the energy transfer between electrons and lattices and is important for understanding the material behavior under thermal non-equilibrium conditions. Here we employed time-resolved electron diffraction at MeV energies to directly study the electron-lattice relaxation in 40-nm-thick polycrystalline copper excited by femtosecond optical lasers. The temporal evolution of lattice temperature over a range of excitation fluences were obtained from the measurements of Debye-Waller decay of multiple diffraction peaks. The lattice temperature results were compared to two-temperature model simulations to derive the electron-lattice coupling strength in copper. This work was supported by the U.S. DOE Office of Science, Fusion Energy Science under FWP #100182.

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