E0008

Femtosecond Electron Diffraction: Probing Structural Dynamics on the Fundamental Timescale.
Jim Cao, Physics Dept. and National High Magnetic Field Laboratory, Florida State Univ., Tallahassee, FL 32310.

Atomic motions on the timescale of single vibrational period (100 fs to ~1 ps) govern the genesis and evolution of new phases in solids, the kinetic pathways of chemical reactions, and the processes of biological functions. The study of structural dynamics on this fundamental level requires monitoring the atomic motions on the milli-ångström length scale and the relevant time scale of 1 ps or less. Recent advances in time-resolved diffraction, using both pulsed x-ray and electron beams, have led to the capability of directly observing the laser-induced lost of long-range order. However, a clear picture of nuclear motions in response to the ultrafast optical excitation remains obscure. In this talk, I will present the results of our recent studies of laser-induced structural dynamics in polycrystalline thin metal films and single crystal CMR samples using femtosecond electron diffraction (FED). With FED, both coherent and thermal atomic motions have been monitored simultaneously on this fundamental timescale, which provides a clear atomic level view of laser-induced lattice dynamics. Some future perspectives of FED will also be presented.

This research is partially supported by the National Science Foundation under the Contract No. DMR-0305519.