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Photo-induced structural dynamics of graphitic carbon studied by ultrafast electron nanocrystallography.[1] RAMANI K. RAMAN, YOSHIE MUROOKA, RYAN A. MURDICK, CHONG-YU RUAN, Michigan State University — We report the studies of photo-induced structural dynamics of graphite and multi-wall carbon nanotubes (MWCNT) using ultrafast electron nanocrystallography. Graphite, upon excitation, contracts along its c-axis causing a reduction of the interlayer distance, which is the first step towards diamondization. MWCNT on the other hand, display an energy-dependent electron-phonon coupling mechanism. Upon excitation at 400nm, the promoted carriers can transfer their excess energy to the lattice rapidly within 5-10 ps whereas at 800nm it takes around 20-30ps for the same. This indicates a more efficient electron-phonon coupling at 400nm where the excited carriers are more strongly coupled to the lattice. Both graphite and MWCNT also exhibit a transient photovoltaic effect where an accumulation of excited charge carriers at the sample interface causes a collective shift of the Bragg peaks. We found that the charge dynamics and atom dynamics are intimately correlated at interfaces.

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