ULTRAFAST CASCADE DYNAMICS FROM LOCAL HEME SITE TO GLOBAL PROTEIN CONFORMATION IN CYTOCHROME *C*

CHEN ZANG, JEFFREY A. STEVENS, JUSTIN J. LINK, LIJUN GUO, and DONGPING ZHONG, *Department of Physics, The Ohio State University, Columbus, Ohio, 43210*.

We report here the femtosecond transient-absorption study of heme dynamics and induced protein conformational relaxations in both ferric and ferrous cytochrome *c*. Upon excitation, the heme in ferric state maintains six coordinates and the dynamics mainly occur at the local site, including ultrafast internal conversion in hundreds of femtoseconds, vibrational cooling within several picoseconds and complete ground-state recovery in 10 ps. While in the ferrous state, the heme transforms into five coordinates with ultrafast ligand dissociation in less than 100 fs, followed by similar vibrational cooling but then recombining back to its original six coordinates in 7 ps. Such impulsive bond breaking and late rebinding generate proteinquakes and strongly perturb the local heme site and shake global protein conformation, which were found to completely recover in 13 ps and 48 ps, respectively.