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Time-Resolved Two-Color X-ray Pump/ X-ray Probe Photoelectron Spectroscopy at LCLS. ANDRE AL HADDAD, GILLES DOUMY, ANTONIO PICON, MAXIMILIAN BUCHER, Argonne National Lab, TAIS GORKHOVER, RYAN COFFEE, MICHAEL HOLMES, JACEK KRZYWINSKI, ALBERTO LUTMAN, AGOSTINO MARINELLI, STEFAN MOELLER, TIMUR OSIPOV, PETER WALTER, DAN RATNER, DIPANWITA RAY, SLAC National Lab, STEPHEN PRATT, LINDA YOUNG, STEPHEN SOUTHWORTH, CHRISTOPH BOSTEDT, Argonne National Lab — Recently, X-ray Free Electron Lasers (XFELs) proved the ability to produce two intense femtosecond x-ray pulses with controlled time delay and color. Combining these unique capabilities with X-ray photoelectron spectroscopy (XPS), a powerful tool for extracting chemical information of a specific site by measuring the binding energy of core electrons, enables femtosecond time-resolved XPS experiments with chemical and site specificity. We will present our X-ray pump/X-ray probe XPS experiment aimed at studying energy flow and relaxation dynamics in CO, i.e. small hetero-nuclear molecules, in the gas phase. The data gives a glimpse of electronic and nuclear relaxation pathways upon resonant oxygen K-edge excitation proceeding on time scales <40 fs. The experimental efforts are accompanied by theoretical work describing the time-resolved core-level photoemission with a time-dependent Schrodinger equation. This work lays the groundwork for further TR-XPS experiments following energy and charge transfer processes upon photo excitation in more complex molecules.

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