ULTRAFAST X-RAY MULTI-EDGE SPECTROSCOPY WITH 100kHz OPCPA-DRIVEN HIGH HARMONIC GENERATION SOURCE

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Time-resolved inner shell absorption spectroscopy is a sensitive and localized probe of valence electronic dynamics. By measuring the temporal evolution of near-edge absorption features of multiple atoms simultaneously, complex dynamics can be separated into the individual underlying processes. In the condensed phase, the migration of both electrons and holes can be tracked during photoinduced interfacial electron transfer between a Ruthenium (Ru) metal complex and a copper oxide (CuO) substrate via transient absorption measurements at the various molecular and substrate specific atomic edges. A femtosecond water window source spanning the Carbon, Nitrogen, and Oxygen K-edges can also be used to follow the valence electronic dynamics and concerted nuclear motion of UV excited molecules such as nitrobenzene. We report progress on our development of such a source based on high harmonic generation (HHG) driven by a 100 kHz, $>$100 W optical chirped pulse parametric amplifier and transient absorption measurements of the above systems.