UNDERSTANDING CARRIER AND ELEMENT SPECIFIC DYNAMICS IN ORGANOHALIDE PEROVSKITE BY FEMTOSECOND TABLETOP XUV SPECTROSCOPY

AASTHA SHARMA, MAX A VERKAMP, JOSH VURA-WEIS, *Department of Chemistry, University of Illinois at Urbana-Champaign, Urbana, IL, USA*.

Hybrid organic-inorganic halide perovskites, such as methylammonium lead iodide have emerged as outstanding light absorbing and emitting materials in recent years. Quasi-2D/layered perovskites have also gained significant attention owing to enhanced ambient stability, high luminescence quantum yield and strong excitonic effects. However, our current understanding of the fundamental photophysics in these materials is limited by the overlap of spectral features in the energy ranges studied using traditional methods of time-resolved spectroscopy. Ultrafast extreme ultraviolet (XUV) absorption was used to investigate electron and hole dynamics in perovskites by observing transitions from core level (I 4d and Br 3d) to the valence and conduction bands. Using a table-top instrument, ultrashort (30 fs) pulses of XUV radiation with a broad spectrum (40-75 eV) were generated via high-harmonic generation. Transient absorption measurements using visible pump and XUV probe directly observed carrier and element specific relaxation dynamics in mixed-halide and layered perovskites for above band edge excitation in the femtosecond and picosecond time scales.