HIGH HARMONIC GENERATION XUV SPECTROSCOPY FOR STUDYING ULTRAFAST PHOTOPHYSICS OF COORDINATION COMPLEXES

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Extreme ultraviolet (XUV) spectroscopy is an inner shell technique that probes the $M_{2,3}$-edge excitation of atoms. Absorption of the XUV photon causes a 3p→3d transition, the energy and shape of which is directly related to the element and ligand environment. This technique is thus element-, oxidation state-, spin state-, and ligand field specific. A process called high-harmonic generation (HHG) enables the production of ultrashort (∼20fs) pulses of collimated XUV photons in a tabletop instrument. This allows transient XUV spectroscopy to be conducted as an in-lab experiment, where it was previously only possible at accelerator-based light sources. Additionally, ultrashort pulses provide the capability for unprecedented time resolution (∼50fs IRF). This technique has the capacity to serve a pivotal role in the study of electron and energy transfer processes in materials and chemical biology. I will present the XUV transient absorption instrument we have built, along with ultrafast transient $M_{2,3}$-edge absorption data of a series of small inorganic molecules in order to demonstrate the high specificity and time resolution of this tabletop technique as well as how our group is applying it to the study of ultrafast electronic dynamics of coordination complexes.