ULTRAFAST XUV MAGNETIC CIRCULAR DICHROISM: OBSERVING SPIN TRANSPORT AT INTERFACES

ROBERT BAKER, *Department of Chemistry and Biochemistry, The Ohio State University, Columbus, OH, USA*; MARTIN SCHULTZE, *Institute of Experimental Physics, Graz University of Technology, Graz, Austria*; HARSHAD GAJAPATHY, *Chemistry and Biochemistry, The Ohio State University, Columbus, OH, USA*; SAVINI SANDUNIKA BANDARANAYAKE, EMILY B HRUSKA, STEPHEN LONDO, *Department of Chemistry and Biochemistry, The Ohio State University, Columbus, OH, USA*.

In time resolved spectroscopy of molecular systems, spectral signatures are directly correlated with processes such as charge migration, intra and intermolecular vibrational relaxation, internal conversion, and intersystem crossing. However, the challenge of probing these analogous processes in material systems with surface sensitivity and ultrafast time resolution motivates the goal to extend a molecular-level understanding to dynamics at surfaces and interfaces.

In this talk, we describe the recent ability to directly observe spin-polarized electron transport at semiconductor surfaces using XUV Magnetic Circular Dichroism (XUV-MCD) in a reflection geometry. The ability to produce spin polarized currents at interfaces underlies many promising applications ranging from spintronics to enantioselective photocatalysis, but designing materials capable of these applications requires an improved understanding of spin-dependent electron dynamics at interfaces. Towards this goal, XUV-MCD reflection-absorption spectroscopy provides direct observation of spin dynamics in magnetic materials with ultrafast time resolution and surface sensitivity.

Yttrium iron garnet ($Y_3Fe_5O_{12}$, YiG) is a ferrimagnetic semiconductor, consisting of two sub-lattices based on octahedrally and tetrahedrally coordinated Fe(III) centers. A combination of linearly and circularly polarized XUV measurements at the Fe $M_{2,3}$-edge of YiG provides a detailed picture of these lattice-dependent electron dynamics, which give rise to spin polarized current at the YiG surface upon band gap excitation. These findings have important applications towards the development of spin selective photocatalysts as well as new platforms for light-induced control of ultrafast spin polarization at material interfaces.