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Toward picosecond time-resolved X-ray absorption studies of interfacial photochemistry[1] OLIVER GESSNER, JOHANNES MAHL, STEFAN NEPPL, Lawrence Berkeley Natl Lab — We report on the progress toward developing a novel picosecond time-resolved transient X-ray absorption spectroscopy (TRXAS) capability for time-domain studies of interfacial photochemistry. The technique is based on the combination of a high repetition rate picosecond laser system with a time-resolved X-ray fluorescent yield setup that may be used for the study of radiation sensitive materials and X-ray spectroscopy compatible photoelectrochemical (PEC) cells. The mobile system is currently deployed at the Advanced Light Source (ALS) and may be used in all operating modes (two-bunch and multi-bunch) of the synchrotron. The use of a time-stamping technique enables the simultaneous recording of TRXAS spectra with delays between the exciting laser pulses and the probing X-ray pulses spanning picosecond to nanosecond temporal scales. First results are discussed that demonstrate the viability of the method to study photoinduced dynamics in transition metal-oxide semiconductor (SC) samples under high vacuum conditions and at SC-liquid electrolyte interfaces during photoelectrochemical water splitting. Opportunities and challenges are outlined to capture crucial short-lived intermediates of photochemical processes with the technique.

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Oliver Gessner
Lawrence Berkeley Natl Lab

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