TOWARDS SOLUTION-PHASE TRANSIENT XUV ABSORPTION SPECTROSCOPY OF IRON TETRAPHENYLPORPHYRIN

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Ultrafast extreme ultraviolet (XUV) absorption spectroscopy can probe the dynamics of excited states in first-row transition metals complexes with sensitivity to the oxidation state, spin state, and ligand field of the metal center. This technique is performed with a tabletop instrument and probes the M-edge transitions from the 3p to the 3d orbital of a metal center. XUV absorption spectroscopy has until now been limited to studying solid-state or gas-phase samples due to the short penetration depth of XUV photons and the high-vacuum conditions. To study solution-phase chemistry with XUV absorption, I used a microfluidic chip to generate free-flowing, submicron thick liquid sheets of nonpolar, XUV transmissive solutions. I have characterized the thickness and stability of dichloroethane liquid sheets under vacuum and have adapted our tabletop high-harmonic instrument to maintain high vacuum during liquid flow. This sample delivery method will be used to study the solution-phase excited state dynamics of iron(III) tetraphenyl porphyrin chloride (FeTPPCl). This will help to understand the impact of a solution-phase on the excited state dynamics at the FeTPPCl metal center and elucidate the ability of FeTPPCl to act as a photocatalyst in solution.