Time-resolved photoelectron imaging with a vacuum-integrated hollow capillary fiber light source

Content

We exploit the phenomenon of resonant dispersive wave emission in gas-filled hollow capillary fibers (HCFs) to realize time-resolved photoelectron imaging measurements with an extremely short temporal resolution. By integrating the output end of an HCF directly into a vacuum chamber assembly we demonstrate two-color deep ultraviolet (DUV)-infrared instrument response functions of just 10 and 11 fs at pump wavelengths of 250 and 280 nm, respectively. This result represents a notable advance in the state of the art of ultrafast photoelectron spectroscopy. We then present a preliminary proof-of-capability measurement investigating the excited state photochemical dynamics operating in the *N*-methylpyrrolidine molecule. Given the substantial interest in generating extremely short and highly tunable DUV pulses for many advanced spectroscopic applications, we anticipate our initial setup will stimulate wider uptake of this approach – particularly given the relatively compact and cost-effective nature of the HCF source.

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