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# Extreme Ultraviolet (EUV) Laser Photoionization: Advancing high spatial resolution multi-collector mass spectrometry

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We built a new analytical instrument for high spatial resolution isotopic mapping using an extreme ultraviolet (EUV) laser photoionization source coupled to a multi-collector mass spectrometer. The EUV source is a capillary discharge laser that operates at a wavelength of 46.9 nm and offers distinct advantages in both sample ablation and ionization over longer wavelength lasers. Firstly, the EUV light can be focused down to spots on the order of 100 nanometers, enabling nanoscale spatial resolution. Secondly, the laser's energetic 26.4 eV photons have the unique ability to efficiently atomize and ionize virtually any type of sample material.

To integrate the EUV laser technology into existing analytical systems, we reconfigured an off-the-shelf Thermo NeptunePlus multi-collector mass spectrometer. By removing its standard inductively coupled plasma (ICP) source, we retrofitted the instrument with our EUV laser ion source. This integration demanded significant modification to the mass spectrometer's ion optics, electric sector, magnetic sector, and detectors to enable it to accommodate and efficiently transport pulsed ion packets generated by EUV laser photoionization. In this presentation, the performance characteristics of the new instrument, including its sensitivity and sample utilization efficiency (SUE) for actinide measurements, will be outlined using the series of NIST61x glasses. Additionally, isotope ratio measurements of $^{235}U/^{238}U$ from different uranium samples will be demonstrated as well as isotopic mapping of U particles at the sub-micron scale.




