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Ionization Mechanisms in a Laser-Produced Plasma for Single Particle Aerosol Mass Spectrometers AMANDA LIETZ, JEFFREY MUSK, MATTHEW HOPKINS, BENJAMIN YEE, HARRY MOFFAT, DORA WIEMANN, TAYLOR SETTECERRI, MICHAEL OMANA, Sandia National Laboratories — Single particle aerosol mass spectrometers (SPAMS) are an emerging technology which can provide high sensitivity mass spectra for aerosols. For example, SPAMS could enable real-time measurements of pollution rather than collection on filters and processing in a laboratory. Obtaining mass spectra for individual particles rather than an average also provides more information than the average alone. In this presentation, the ionization mechanisms and plasma chemistry which occur in a SPAMS system are investigated using computational modeling. A 1 μm aluminum sphere is vaporized, and the resulting gas is ionized by a 248 nm laser with an 8 mJ, 8 ns pulse. The initial vaporization is investigated using a hydrodynamics model, and upon transition to gas phase, the plasma chemistry is modeled with a 0-dimensional model. It was found that pressure broadening can lead to direct absorption of laser photons, despite the laser wavelength being 9 nm from resonance with a transition. Photoionization of electronic excited states also plays a significant role. The effects of particle diameter and laser intensity on the ionization fraction and dominant ionization mechanisms are discussed. *SNL is managed and operated by NTESS under DOE NNSA contract DE-NA0003525.*

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