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**In-situ target preparation and characterization for mono-energetic laser driven ion sources** CORT GAUTIER, Los Alamos National Laboratory, KIRK FLIPPO, ROLAND SCHULZE, BRIAN ALBRIGHT, LIN YIN, JUAN FERNANDEZ, MANUEL HEGELICH, LANL — Recent advances in laser-driven ion acceleration demonstrated the direct production of mono-energetic ion pulses from ultrahigh intensity lasers. A key component responsible for this mechanism is a highly ordered, 10A source layer on a high-Z substrate. Due to the typical vacuum conditions in ultrahigh power laser target chambers, in-situ formation and characterization is a prerequisite to control and manipulate those ion pulses and achieve lower shot-to-shot fluctuations. We present results of an experimental investigation of the in-situ formation and characterization of this ion source layer. Using X-ray photoelectron spectroscopy (XPS) we observed a temperature dependence of the formation of a thin carbon layer on Pd and Pt substrates in a controlled hydrocarbon environment. These results validate our hypothesis for the mechanisms responsible for laser driven mono-energetic ion production and will be compared to PIC simulation and measurements of mono-energetic ions from Pd and Pt targets shot at intensities of I$\sim 10^{19}$ W/cm$^2$ at the Trident short pulse laser facility.

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