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Laser-ion acceleration through controlled surface contamination BIXUE HOU, ZHAOHAN HE, JOHN NEES, University of Michigan, GEORGE PETROV, JACK DAVIS, Naval Research Laboratory, ALEXANDER THOMAS, KARL KRUSHELNICK, University of Michigan — Ion acceleration from interaction of intense laser pulses with solid targets was dominated by protons. This phenomenon is attributed to the presence of protons in the water and hydrocarbon residue on the target surface. Substitution of the contaminant layer on the target surface with a desired species can lead to selection of accelerated ion species and enhancement of acceleration. With a focal intensity of $\sim$4x10^{18}W/cm^2 at 0.5 kHz repetition rate, deuterons up to 75 keV are accelerated from a glass target simply by placing 1 mL of heavy water inside the experimental chamber prior to vacuum-pumping to generate a deuterated contamination layer on the target. Using the same technique with a deuterated-polystyrene-coated target also enhances deuteron yield by a factor of three to five while increasing the maximum energy of the generated deuterons to 140 keV. This technique was further developed by other researchers; the solid target is cryogenic-cooled to produce an ice layer of heavy water for deuteron acceleration.

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