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X-Ray Spectroscopy of Laser-Produced Al Plasma near the Target Surface in a Laser Ion Source

The spatially-resolved X-ray spectrum of laser-produced Al plasma near the target surface has been obtained in the energy range of 1.5-2.2 keV using a compact flat crystal spectrometer. The widely-used temperature and density diagnostics, the line ratios of $Ly\alpha/He\beta$ and $IC/He\alpha$, were measured and compared with the calculation results of a steady-state collisional-radiative model, so that the temperature and density profiles with a spatial resolution of 55 μm were obtained within 200 μm from the target plane. The plasma parameters derived from the spatially-integrated spectrum were used to calculate the ionization state distribution near the target surface with the steady-state model and the result was compared with the ion charge state distribution measured with an Electrostatic Ion Analyzer (EIA) at the distance of 4.2 m from the target surface. The validity of the steady-state model is discussed, as well as the difference between the calculated ion charge state distribution and that measured with the EIA.

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Yes

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