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Effects of light mass doping on ion velocity distribution functions in an electric double layer IOANA A. BILOIU, EARL E. SCIME, West Virginia University, Morgantown, WV 26506 — The effect of a lighter mass ion specie on the Ar and Xe ion velocity distribution functions (ivdfs) in the expansion region of a helicon plasma source has been investigated for those conditions under which an electric double layer (EDL) is known to form, i.e., pressure less than 2 mTorr, source magnetic field strength of 700 G, and expansion chamber magnetic field strength of 20 G. 4 cm upstream from the helicon source-expansion chamber junction, the Ar ivdf, as measured with laser-induced-fluorescence, is bimodal - comprised of a slow, nearly stationary ion population created by local ionization and a fast ion population created by the acceleration through the EDL. With the addition of He gas, the axial flow speed of the fast ion group increases from 5.7 to 7.6 km/s as the He/(He+Ar) mixing ratio increases from 0 to 30%. The slow ion population ivdf includes a long tail that stretches over a velocity range of $\sim$ 5 km/s. Both the fast and slow ion group population densities, decrease as the mixing ratio increases. The slow population almost completely disappears at a ratio of 30%He/70%Ar. Similar effects were observed for Xe plasmas for which the lighter mass ion was Ar. Although no Xe ion beam was observed, addition of Ar led to an increase in the speed of the background ion population from 1.3 km/s in pure Xe to 2.3 km/s for an 87.5% Ar/(Ar+Xe) ratio.

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