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Ion flows in a two-component expanding plasma IOANA BILOIU, EARL SCIME, West Virginia University — The Ar and Xe ion velocity distribution functions (ivdfs), determined by laser induced fluorescence (LIF), in the expansion region of a helicon plasma have been measured as a function of ratio of Xe to Ar gas flow rates for a constant total gas flow rate. In the magnetic field gradient region ($\sim$5cm upstream from the helicon source-expansion chamber junction) and at low pressure ($\leq$ 2 mTorr) the Ar ivdf is bimodal with a fast group at a speed of $\sim$ 7 km/s and a slow group at $\sim$ 3.5 km/s. The bimodal structure persists for a wide range of Ar/Xe gas flow ratios, disappearing (due to the lack of LIF signal) at 10% Xe. Increasing Xe partial pressure does not affect the Ar ion flow velocities, but does decrease the Ar LIF amplitude. Conversely, the Xe ivdf is unimodal with a bulk ion flow of 0.85 km/s. To understand the excitation mechanisms of the investigated ion states, electron energy distribution functions were obtained from planar Langmuir probe characteristics by the Druyvestein method. The eedf is sensitive to the gas composition: for 2% Xe, the eedf changes from a single Maxwellian with a temperature of $\sim$ 7.5 eV to a bi-Maxwellian with a cold component at $\sim$ 2.5 eV and a hot component at $\sim$8.5 eV. The effective temperature calculated from eedf integration exhibits a sharp decrease with increasing Xe fraction, down to $\sim$4.5 eV at 40% Xe and is then constant for larger Xe fractions.

Ioana Biloiu
West Virginia University

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