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Ion Acceleration by Double Layers with Multi-Component Ion Species TIMOTHY GOOD, Gettysburg College, Department of Physics, EVAN AGUIRRE, EARL SCIME, West Virginia University, Department of Physics and Astronomy, WEST VIRGINIA UNIVERSITY TEAM — Current-free double layers (CFDL) models have been proposed to explain observations of magnetic field-aligned ion acceleration in plasmas expanding into divergent magnetic field regions. More recently, experimental studies of the Bohm sheath criterion in multiple ion species plasma reveal an equilibration of Bohm speeds at the sheath-presheath boundary for a grounded plate in a multipole-confined filament discharge.[1] We aim to test this ion velocity effect for CFDL acceleration. We report high resolution ion velocity distribution function (IVDF) measurements using laser induced fluorescence downstream of a CFDL in a helicon plasma. Combinations of argon-helium, argon-krypton, and argon-xenon gases are ionized and measurements of argon or xenon IVDFs are investigated to determine whether ion acceleration is enhanced (or diminished) by the presence of lighter (or heavier) ions in the mix. We find that the predominant effect is a reduction of ion acceleration consistent with increased drag arising from increased gas pressure under all conditions, including constant total gas pressure, equal plasma densities of different ions, and very different plasma densities of different ions. These results suggest that the physics responsible for acceleration of multiple ion species in simple sheaths is not responsible for the ion acceleration observed in these expanding plasmas. * Department of Physics, Gettysburg College.
1. G. Severn et. al., Plasma Sources Sci. Technol. **26** (2017).

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