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Radial distribution of air species diffusing into an RF Helium atmospheric pressure plasma jet[1] TAM NGUYEN, PENG LIN, VINCENT DONNELLY, DEMETRE ECONOMOU, University of Houston — The effluent composition and properties of an atmospheric pressure plasma jet (APPJ) vary with the humidity of the ambient air. In order to achieve better control of the chemistry in the jet a coaxial shielding gas (N_2) is employed that separates the plasma jet from the ambient. In this study, we use optical emission spectroscopy to measure the radial distribution of Ar (naturally occurring in air) diffusing into a 2 slm He plasma jet excited by a 13.7 MHz, 4.5 kV peak voltage. Ar 811.5 nm emission is magnified by a lens, fed into a spectrometer, then Abel inverted. Calibration is obtained by adding a known small amount of Ar to the He feed gas and recording a small increase in Ar emission, providing absolute Ar radial density profiles. At an axial distance of 5 mm from the nozzle, Ar mole fractions of $2.5\text{x}10^{-5}$ and $4\text{x}10^{-5}$ were obtained on axis with 4.5 slm and without nitrogen shielding gas, respectively. The Ar mole fraction was 3X higher at the radial edge of the plasma. At 1 mm from the nozzle, the Ar mole fraction on axis was $1\text{x}10^{-6}$ rising by 5X at the plasma edge. The effect of flow rate of the working and shielding gas will also be shown, along with comparisons with a 2D convective diffusion simulation of species concentration profiles.

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