Design and characterization of a novel coaxial VHF plasma source for air plasma formation  

BRANDON BYRNS, DANIEL WOOTEN, STEVEN SHANNON, North Carolina State University — A key challenge in the expansion of atmospheric plasma applicators into new markets is the effective surface area that these systems can efficiently treat. To this end, a large area atmospheric air glow discharge, with approximately 9.5cm$^2$ cross sectional area, is obtained using a simple coaxial structure. The room air plasma is driven by a 162MHz generator at powers ranging from 300W – 1000W. The VHF drive appears to produce a steady state glow void of streamers or arcs typically found in atmospheric air systems. Electrical measurements coupled with a global plasma model and transmission line theory allow for the calculation of electron density. Densities calculated for 400W are approximately $10^{11}$ cm$^{-3}$. Spectroscopy data shows dominant emissions consist of OH, N$_2$, and N$_2^+$, along with a continuum indicating neutral bremsstrahlung radiation; this is used for electron density calculations and model validation. In this presentation, source design, plasma characterization, and preliminary surface treatments of HDPE will be presented.

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