Abstract Submitted
for the GEC20 Meeting of
The American Physical Society

Characterization of Helium CAP Tubular Source and Investigation of UHMWPE Surface Treatment JACK TURICEK, Mechanical Engineering Department, Milwaukee School of Engineering, NICOLE RATTS, Electrical Engineering and Computer Science Department, Milwaukee School of Engineering, MATEY KALTCHEV, NAZIEH MASOUD, Physics and Chemistry Department, Milwaukee School of Engineering — Cold atmospheric plasma (CAP) is a simple and inexpensive method to produce plasma in ambient air. In this study, optical emission spectroscopy was used to determine plasma species along the plasma plume generated when helium gas flowed through a tubular CAP source. Four positions along the plume were investigated at flowrates of 2, 3, and 5 scfh. Results revealed the plume consisted of a varying composition of excited state species dependent on the location and source flowrate. Identified in the emission spectra was the N 2 Second Positive and First Negative System along with an OH emission at 308 nm. The OH emission, found at the opening of the tube, had a higher intensity as the flowrate increased and was attributed to water condensation on the inner tube surfaces, while the N 2 emission came from the nitrogen of the ambient air. The plasma was used to treat Ultra-High-Molecular- Weight Polyethylene (UHMWPE), a primary material in joint replacements. Results of the plasma treatment showed a significant increase in roughness, decrease in contact angle, and no substantial change in hardness. These improvements to the adhesion and lubrication properties of the polymer examined point to a better suitable surface for use in artificial joints.

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Date submitted: 08 Sep 2020 Electronic form version 1.4