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Influence of charge accumulation on a dielectric capillary atmospheric pressure plasma jet BRIAN SANDS, UES, Inc., SHIH KANG HUANG, JARED SPELTZ, MATTHEW NIEKAMP, Wright State University, BISWA GANGULY, Air Force Research Laboratory — Using a single ring electrode configuration and a positive unipolar pulsed voltage source, we examine the influence of the dielectric barrier on the distribution of ionization in a streamer-like dielectric capillary plasma jet utilizing a rare gas flow as a function of anode placement and pulse repetition frequency. At low frequencies, when the anode is recessed at least 5 mm along the capillary, two regions of enhanced ionization can be resolved near the anode and near the capillary tip that are associated with two distinct peaks in the discharge current and locally increased emission intensity in the residual streamer channel. With the anode placed $\sim$20 mm from the capillary tip, the two current peaks were $\sim$13 mA. Increasing the frequency between 6 and 10 kHz, the capillary tip enhancement expanded towards the anode and concentrated there at higher frequencies. The discharge current over this frequency range rose to 18 mA and was increasingly dominated by the earlier peak associated with ionization near the anode. This increased charging of the dielectric surface and reduced the potential available to the ionization front outside the capillary as indicated by a 25% drop in velocity and reduced emission intensity. The surface charging effect is visualized at discharge inception using a Phantom high-frame-rate CCD camera.

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