ELECTRICAL AND OPTICAL EMISSION MEASUREMENTS OF A CAPILLARY DIELECTRIC BARRIER DISCHARGE*

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The electrical and emission properties of a capillary DBD (Cap-DBD) plasma in atmospheric pressure air are reported in this work. The plasma reactor consists of metal wire electrodes inside quartz capillary tubes powered with a low kilohertz frequency AC high voltage power supply. Various reactor geometries (planar, 3-D multilayer, and circular) with no gap spacing up to a few hundred micron gaps were investigated. The discharges appear homogenous across the whole device at gaps between 0 and 225 μm and turned into filamentary discharges at larger gap spaces. The operating voltage was generally around 3-4 kV (RMS). The power consumption by the Cap-DBD was calculated using voltage/charge Lissajous figures with observed powers of a few tens of watts, reaching a maximum for a particular gap distance at 225 μm. Further studies of optical emission spectroscopy (OES) were employed to evaluate the reactive species generated in the microplasma source. The observed emission spectrum was predominantly within the second positive system of N_2 ($C^3\Pi_u - B^3\Pi_g$) and the first negative system of N_2^+ ($B^2\Sigma_u^+ - X^2\Sigma_g^+$).

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