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Simulation of the dynamics of a helium discharge in a thin dielectric tube at atmospheric pressure JAROSLAV JANSKY, FRANCOIS PECHEREAU, ANNE BOURDON, ECP, lab EM2C, Chatenay-Malabry, France —

In this work, we propose to study the dynamics and structure of helium discharges at atmospheric pressure in dielectric tubes. A typical geometry of an atmospheric pressure plasma jet is used: the discharge is initiated in a thin dielectric tube by two annular electrodes around the dielectric tube. The simulations are performed using a 2D axisymmetric fluid model for helium assuming that secondary electron emission at the tube inner surface is only due to ion bombardment. In this work, we propose to study the influence of the electrode set-up (size of ring electrodes and interelectrode gap distance) and the characteristics of the tube (radius and permittivity) on the discharge structure and propagation velocity. The results show that the grounded annular electrode accelerates the discharge propagation in the tube between both electrodes but reduces the discharge propagation velocity in the tube as the discharge escapes from the interelectrode gap. These results are qualitatively in good agreement with experiments and confirm the streamer-like mechanism of generation and propagation of discharges in dielectric tubes.

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