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Simulation of the propagation of an air plasma discharge at atmospheric pressure in a capillary glass tube : influence of the confinement on the discharge reactivity JAROSLAV JANSKY, FABIEN THOLIN, ZDENEK BONAVENTURA, ANNE BOURDON, EM2C, UPR CNRS 288, Ecole Centrale Paris, Grande voie des vignes, 92295 Chatenay-Malabry Cedex, France — This work presents simulations of the spatio-temporal distributions of electric field and electron density during the propagation of an air discharge in capillary tubes using a fluid model. The discharge is initiated by a positive voltage needle set inside a capillary glass tube with a variable inner radius. Pulsed applied voltage of different amplitudes and rise times are used. Depending on the applied voltage and radius of the tube, a stable discharge propagates in the tube with a homogeneous planar front or a tubular shape. As a reference, we have studied the discharge dynamics without tube and in this case, the discharge propagates with a maximum electric field of $E \sim 100$ kV/cm for a wide range of applied voltages. With a capillary glass tube, the values of the maximum electric field depend on the applied voltage and inner radius of the tube and values up to $E = 500$ kV/cm have been obtained. Then, a higher reactivity of the air discharge with the capillary tube than without is expected, which is particularly interesting for applications.

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