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Air-Plasma Bullets Propagating Inside Microcapillaries and in Ambient Air DEANNA A. LACOSTE, ANNE BOURDON, CNRS UPR288 Laboratoire EM2C, Ecole Centrale Paris, KOICHI KURIBARA, KEIICHIRO URABE, SVEN STAUSS, KAZUO TERASHIMA, Department of Advanced Materials Science, Graduate School of Frontier Sciences, The University of Tokyo — We report on the characterization of air-plasma bullets formed inside microcapillary tubes and in ambient air, obtained without the use of inert or noble gases. The bullets are produced by nanosecond discharges, applied at 1 kHz in a dielectric barrier discharge configuration. The anode consists of a tungsten wire with a 50-μm diameter, centered in the microcapillary, while the cathode is a silver ring, fixed on the outer surface of the fused silica tube. The gap distance is kept constant at 1.35 mm. The microcapillary is fed with a 4-sccm flow of air at atmospheric pressure. In the tubes and in ambient air, the propagation of air plasma bullets is observed. The temporal evolution of the bullet propagation has been studied with the aid of an ICCD camera. The effect of the applied voltage (from 5.2 to 8.2 kV) and the inner diameter of the microcapillaries (from 100 to 500 μm) on the discharge dynamics are investigated. Inside the tubes, while the topology of the bullets seems to be strongly dependent on the diameter, their velocity (on the order of 1 to 5x10^5 ms^{-1}) is only a function of the applied voltage. In ambient air, the air-plasma bullets propagate at a velocity of 1.25x10^5 ms^{-1}. Possible mechanisms for the propagation of air-plasma bullets in ambient air are discussed.

Deanna A. Lacoste
CNRS UPR288 Laboratoire EM2C, Ecole Centrale Paris

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