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A stable filamentary RF plasma jet generated at atmospheric pressure within a capillary dielectric tube

Gheorghe Dinescu[1], Maximilian Teodorescu[1], Ionita Eusebiu Rosini[1], Marian Bazavan[2]

[1]N.I.L.P.R.P., Magurele, Romania [2]Physics Department, University of Bucharest, Magurele, Romania

dinescug@infim.ro

Long, and yet thin non-thermal atmospheric plasma jets are required for applications in dentistry, medicine, electronics. Besides the dielectric barrier discharges (DBD's), no other type of plasma devices can achieve the goal of being cold yet having a length of centimeters. In this contribution we present a study of a long (30-60 mm) and thin (0.6 mm) atmospheric pressure plasma jet generated from the inside a thin glass tube. The discharge is operated at 13.56 MHz and the flowing gas used is Argon. No internal electrode is used during operation, and the grounded electrode is distributed. The study comprises imagistic, spectral and electrical measurements, each contributing to the understanding of the operating domains of this plasma source. The aspect and stability of the discharge was observed in detail during expansion in argon and air, with obvious changes due to operation in the open ambient. The temperature of the jet was extracted by comparing the acquired OH spectra with the simulated ones. It was found that the value is in the low temperature domain, thus the plasma being cold. The jet reflects on surfaces, as paper or polymeric foils, without significant spreading.

Keywords
atmospheric pressure plasma
filamentary discharge
non-thermal plasma