

Investigation on the streamer propagation in atmospheric pressure helium micro plasma jet by the capacitive probe

Wen-Chao Zhu, Qing Li, Xi-Ming Zhu and Yi-Kang Pu

Department of Engineering Physics, Tsinghua University, Beijing 100084, China

The atmospheric pressure micro plasma jet devices have attracted significant attention for their potential application in material processing and biomedicine. This kind of plasma jet is found to be in the form of “plasma bullet” propagating with velocities in the range of 10^4 - 10^5 m/s, by high-speed photographs. In this work, the streamer propagation in the atmospheric pressure helium micro plasma jet is investigated by measuring the net space charge and mean propagation velocity of the plasma bullet. This is done by using the nonintrusive capacitive probe in the discharge configuration with a floating ground electrode nozzle. The net space charge in the plasma bullet is found to increase with the applied voltage, and it enhances the propagation velocity. The applicability of the streamer mechanism to the propagation of the plasma bullet is validated by this electrical diagnostic method. In the end, the physical scenario of the whole discharge process of this kind of micro plasma jet is revealed.

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