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Characteristics of a diffuse brush-shaped plasma plume produce by a dielectric barrier discharge at atmospheric pressure XUECHEN LI, Hebei University — Atmospheric pressure non-thermal plasmas generated by gas discharges have attracted much attention because chemically active species are abundant in these plasmas. They have enormous application potentials in various fields of science and technology. The scale is not desirable for the diffuse discharge generated by existing technologies, such as dielectric barrier discharge or plasma jet. The challenge that low-temperature plasma research encounters is how to generate large scale plasma at atmospheric pressure. With argon used as working gas, a barrier discharge device composed of two diverging wire electrodes is developed to generate a diffuse brush-shaped plasma plume outside a wedged gap. The parameter range for plume generation and its discharge characteristics are studied through electrical and optical methods. The spatial and temporal evolution is implemented by fast photography to investigate the formation mechanism of the plume. It is found that the large-scale plume is a superposition of micro-discharge filaments gliding along the argon flow, which operate in a glow discharge regime. Optical emission spectrum has been collected from the diffuse plume to investigate the excited electron temperature, the vibrational temperature and the gas temperature of the diffuse plume. Results indicate that the plasma is in non-equilibrium condition.

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