

Development and characterization of low-temperature atmospheric pressure plasma jet

Veda Prakash, Kiran Patel, Narayan Behera, Ajai Kumar

Institute for Plasma Research, Bhat, Gandhinagar, HBNI, Mumbai, India

prakashgveda@gmail.com

Atmospheric pressure plasma jet (APPJ) source with helium (He) as an active gas is developed. 4 kV p-p, 33 kHz sinusoidal voltage is used to produce plasma jet. He gas with flow rates of up to 11 liters per minute is used to produce plasma plume of around 6 cm in length into the ambient air. Thorough characterization of the plume has been carried out using optical diagnostics such as emission spectra measurements, ICCD imaging and electrical discharge using voltage and current probes. Plasma discharge parameters such as electron excitation temperature and gas temperature are estimated using emission spectra and are 800K and 305 K respectively. Further additional plume parameters such as velocity and plume current are also estimated using ICCD images and current transformer. By using velocity and plume current values, the density along the length of the plasma plume has been assessed and the values are in the range of $0.05\text{-}3.2 \times 10^{12} \text{ cm}^3$ at various positions of the plume length. Furthermore, the discharge ignition and plasma plume dynamics with flow rate will be presented.

References:

- [1] M. Laroussi, M. G. Kong, G. Morfill, W. Stolz, Plasma Medicine: Applications of Low-Temperature Gas Plasmas in Medicine and Biology, Cambridge University Press, 2012,
- [2] K. Yambe, H. Saito, and K. Ogura, IEEJ Trans. Electr. Electron. Eng. 10, 614–618 (2015)
- [3] M. Laroussi, X. Lu, M. Keidar, J. Appl. Phys., vol. 122, no. 2, pp. 020901, 2017