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Laser-induced Fluorescence and Optical Emission Spectroscopy for the Determination of Reactive Species in the Effluent of Atmospheric Pressure Low Temperature Plasma Jets XUEKAI PEI, HuaZhong University, HAMID RAZAVI, Old Dominion University, XINPEI LU, HuaZhong University, MOUNIR LAROUSSI, Old Dominion University — OH radicals and O atoms are important active species in various applications of room temperature atmospheric pressure plasma jet (RT-APPJ). So the determination of absolute density of OH radicals and O atoms in RT-APPJs is necessary. In this work, the time and spatially resolved OH radicals density of a RT-APPJ are measured using the laser-induced fluorescence (LIF) technology [1]. In addition, the spatial distribution of the emitting species along the axial direction of the jet is of interest and is measured using optical emission spectroscopy. The absolute OH density of the RT-APPJ is about 2.0×10^{13} cm^{-3} at 5 mm away from the plasma jet nozzle and 1 μs after the discharge. The OH density reaches a maximum when H_2O concentration in helium gas flow is about 130ppm. In order to control the OH density, the effect of voltage polarity, applied voltage magnitude, pulse frequency, pulse width on the OH density are also investigated and discussed. O atoms are investigated by TA-LIF. It is demonstrated that the O atoms density reaches a maximum when O_2 percent is about 0.3% in pure He and the lifetime of O atoms in RT-APPJ is much longer (up to dozens of ms) than OH radicals.

[1] X. Pei, Y. Lu, S. Wu, Q. Xiong, X. Lu, Plasma Sources Science and Technology, 2013, 22(2): 0250232.

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