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Low temperature, high-density microplasma plume generated in a micro-tube with variable inner diameter JIANMIN GOU, XINPEI LU, Huazhong University of Science Technology — A low temperature helium microplasma plume generated in a micro quartz tube with inner diameter decreasing from 245 μm to 6 μm is reported. The microplasma plume has a length of around 1.5 cm and reaches the position with its diameter down to 10 μm . Though the inner diameter of the tube is in sub-millimeter, the cross section of the tube is not fully filled with the plasma only until the tube inner diameter is down to 30 μm . The electron density estimated from H_α stark broadening increases as the inner diameter of the tube decreases. The ignition voltage increases from 11 kV to 40 kV as the diameter of the inner quartz tube decreases from 245 μm to 10 μm . Further analysis shows that, in order to ignite a non-equilibrium plasma plume in 1 μm diameter tube, the applied voltage of about 65 kV is needed and the plasma density could reach as high as on the order of 10^{18} cm^{-3} , which is interesting for the studies of several fundamental phenomena such as plasma sheath structure.

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