Supplementary Information

Radially Resolved Optical Emission Spectral Imaging Diagnostics of Atmospheric Pressure μDBD Jet for Direct Surface Solid Sampling Analysis

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Section 1

The schematic and concept of push-broom hyperspectral imaging system used in the lab.

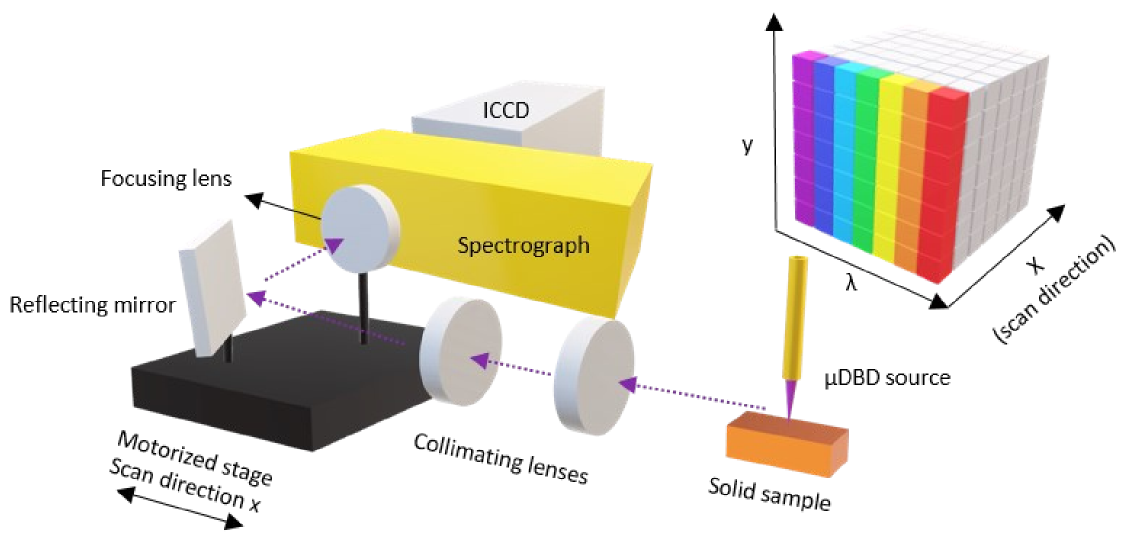

Figure S1. Schematic of push-broom hyperspectral imaging system. The hyperspectral datacube (upper right) contains the emission information of vertical direction (y), horizontal direction (scanning x), and spectral direction (λ).

Section 2

The LIFBASE software is used to simulate and determine the rotational temperature based on the N_2^+ first negative system. The best fitted temperature is determined by the least Chi-square value (χ^2) between the experimental spectra data and the simulated model data.

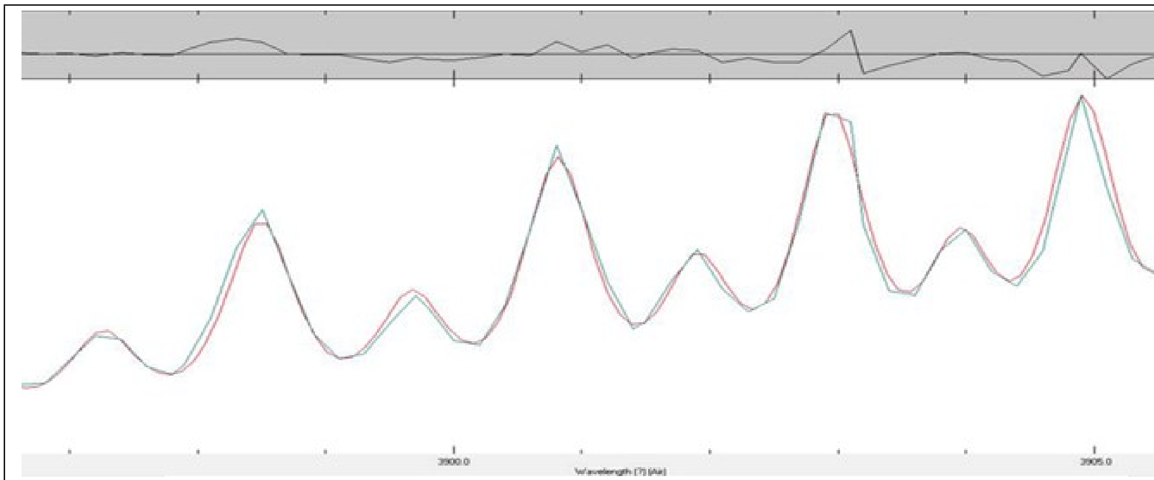

Figure S2. Comparison of experimental spectra of N_2^+ first negative system (blue) and the simulated spectra by LIFBASE (red). The total resolution is 0.7664 nm (instrumental + broadening), the pressure is 760 Torr in Air, and the line shape is Voigt with 15% Lorentzian. The shaded area represents the difference profile between the experimental and simulated spectra.

Section 3

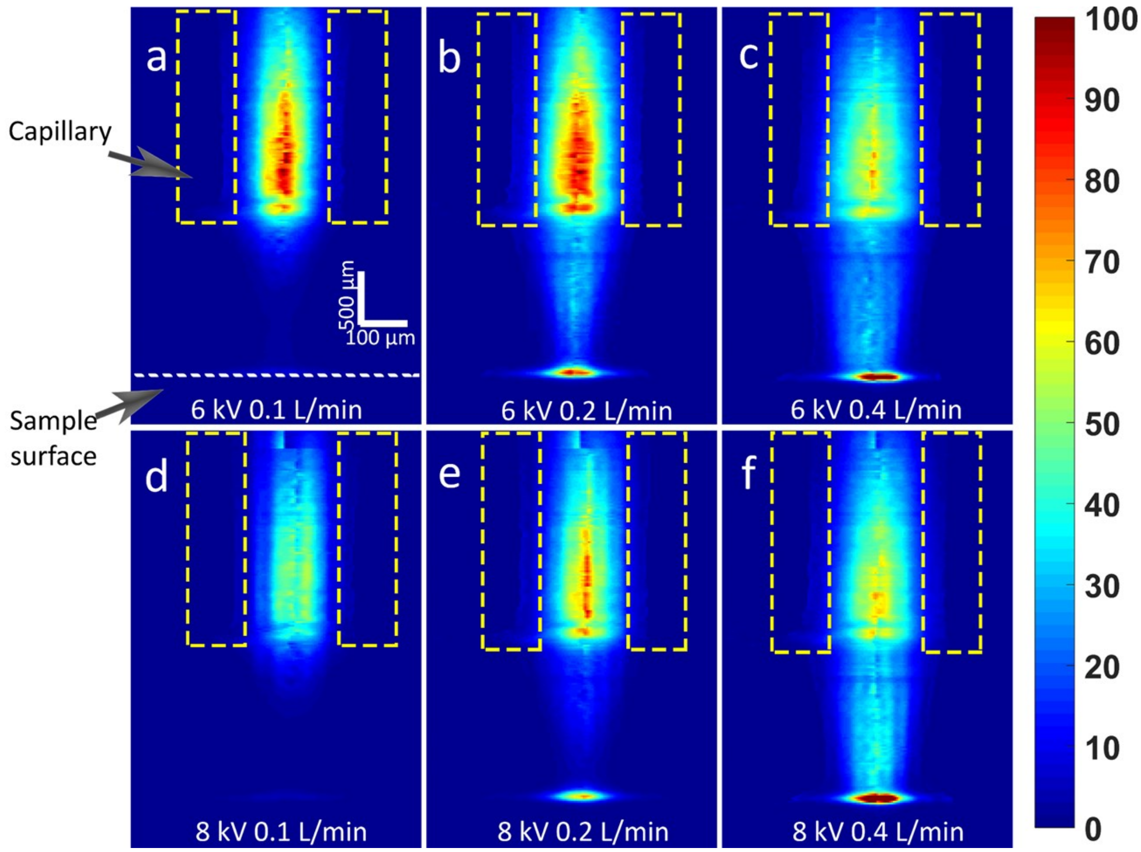

Figure S3. Radially resolved He I (587.6 nm, 3d $^3D_{1,2,3} \rightarrow$ 2p $^3P_{0,1,2}^{o}$) optical emission intensity maps at varying applied voltage and plasma gas flow rate.

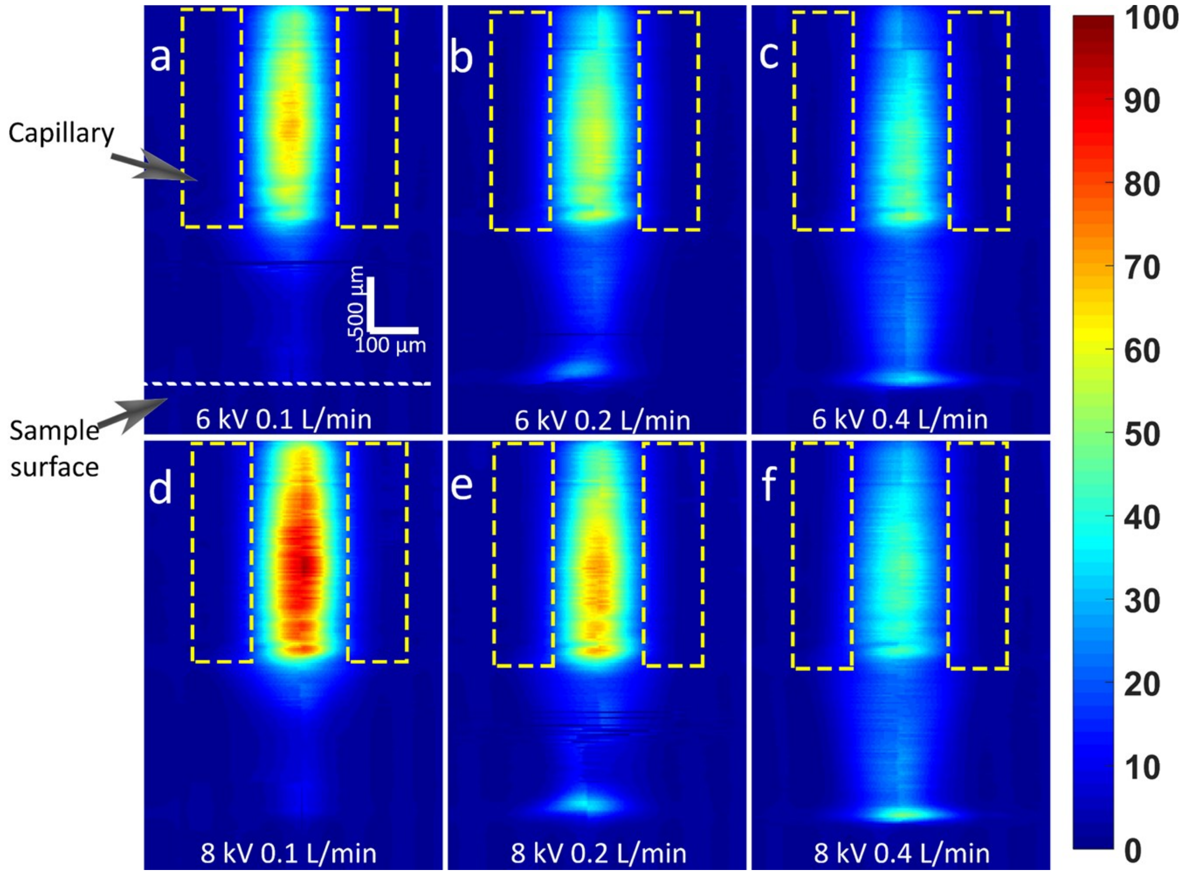

Figure S4. Radially resolved He I (388.9nm, $3p^3P_2 \rightarrow 2s^3S_1$) optical emission intensity maps with 1800 grating at varying applied voltage and plasma gas flow rate.

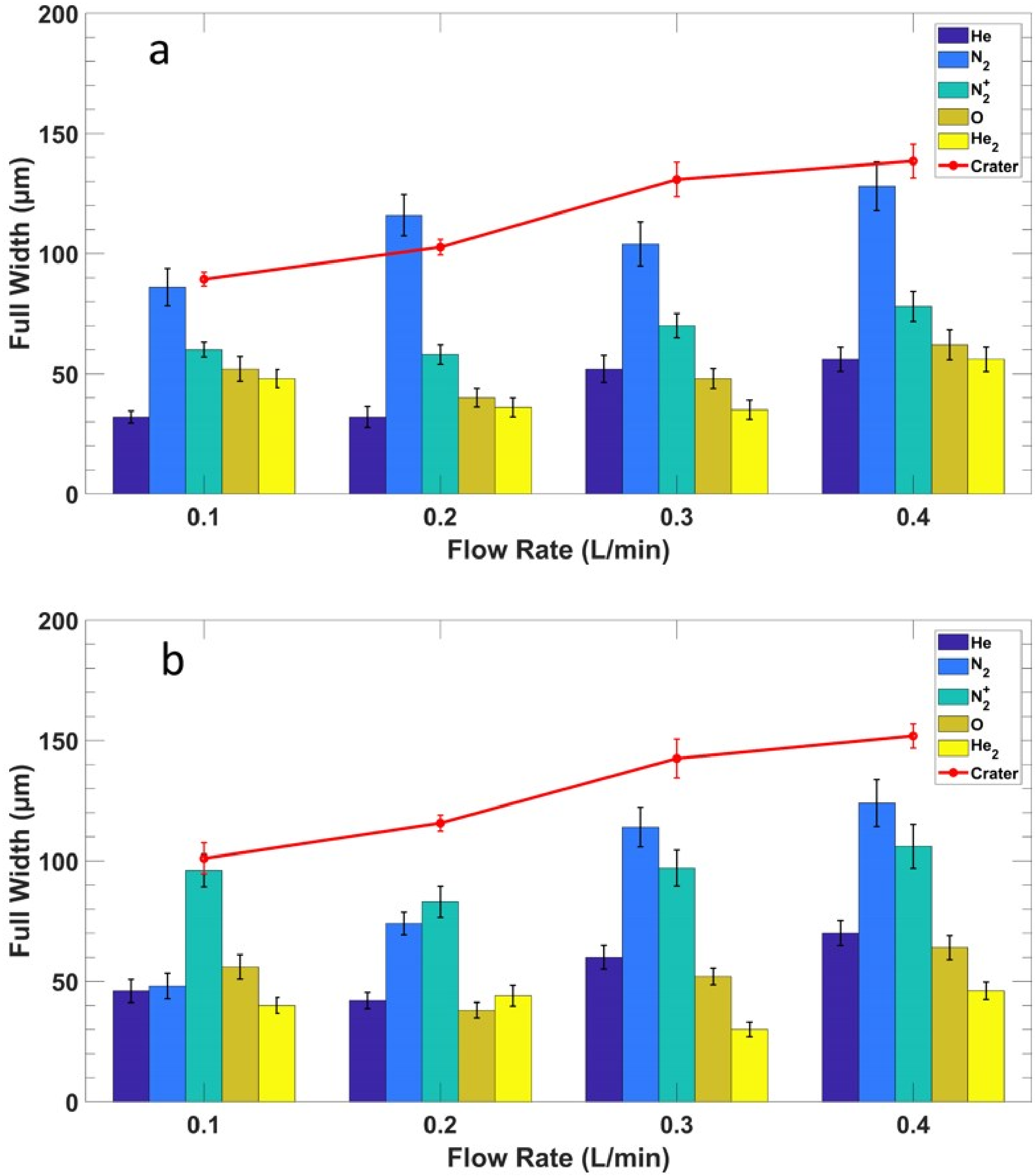

Figure S5. The full width at half maximum of the radially resolved emission of He, N_2, N_2^+, O, and He2 (bar) at 52 μm above the sample surface compared with the FWHM of the erosion crater (red line) from 0.1 to 0.4 L/min flow rate. The applied voltage is a) 6 kV and b) 8 kV. The error bars represent the standard deviation of the triplicate measurements.

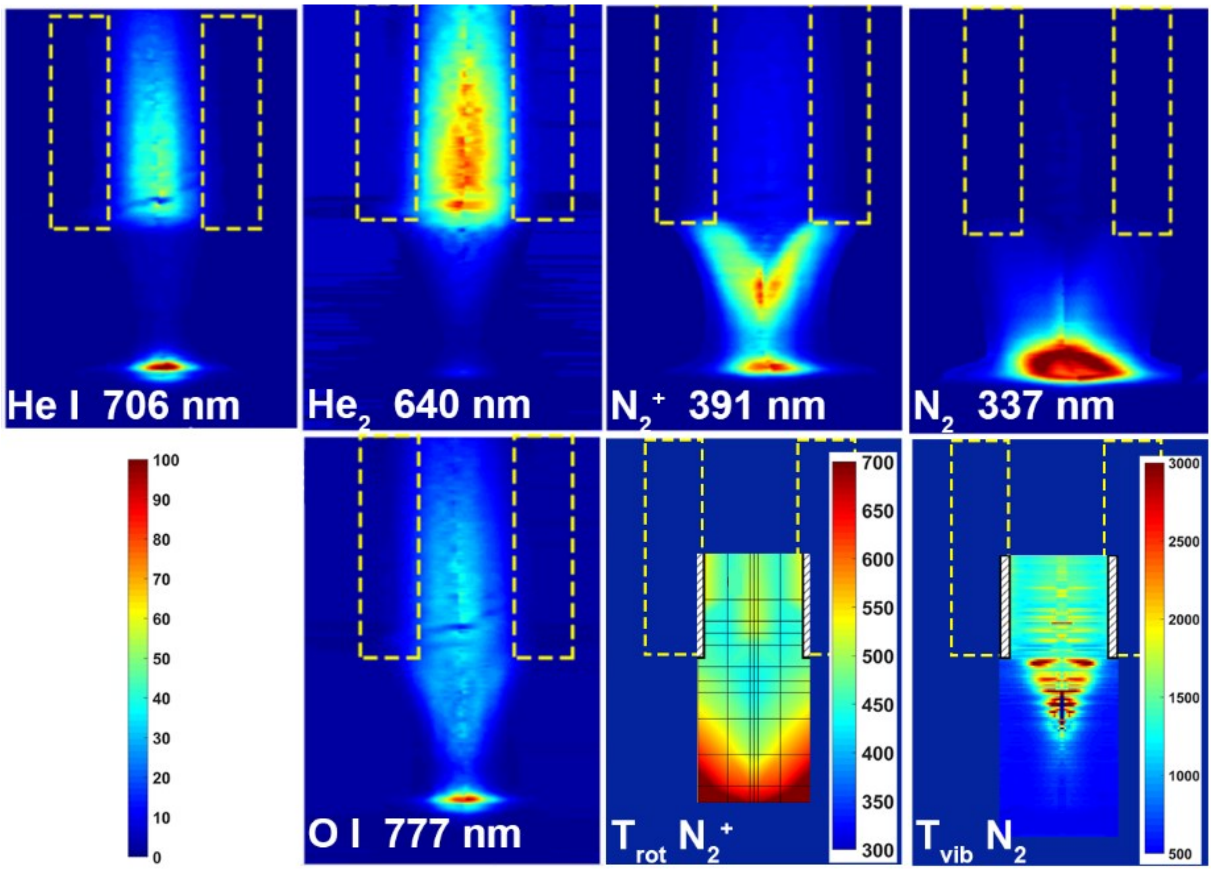

Figure S6. Radially resolved optical emission intensity maps for He I, O I, N_2^+, N_2, and He_2, as well as the corresponding N_2^+ T_{rot} and N_2 T_{vib}. Operating conditions were set at 8kV and 0.2L/min.

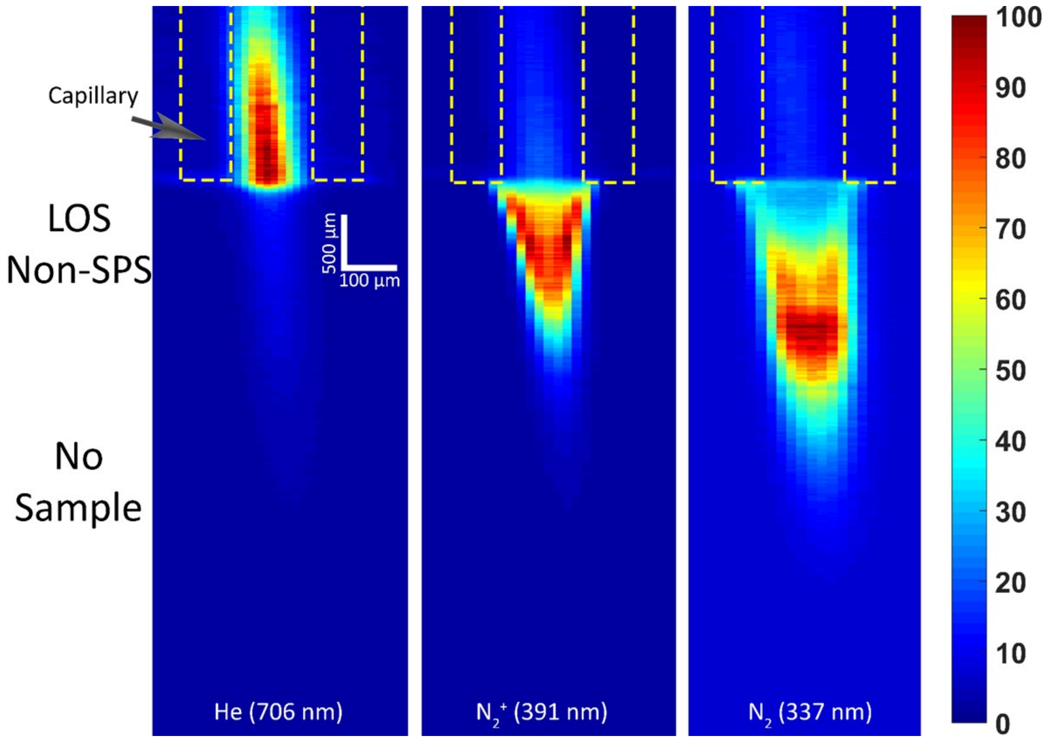

Figure S7. Line-of-sight emission with no sample substrate underneath the plasma capillary at 706.5 nm (He I), 391 nm (N_2^+), and 337 nm (N_2), for operating conditions of 8kV and 0.4L/min.