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Spatially Resolved Gas Temperature Measurements in an Atmospheric Pressure DC Glow Microdischarge with Raman Scattering S. BELOSTOTSKIY, Q. WANG, V. DONNELLY, D. ECONOMOU, N. SADEGHI, DEPT. OF CHEM. ENG., U. OF HOUSTON TEAM, U. FOURIER DE GRENOBLE TEAM — Spatially resolved rotational Raman spectroscopy of ground state nitrogen $N_2(X^1\Sigma_g^+)$ was used to measure the gas temperature (T_g) in a nitrogen dc glow microdischarge (gap between electrodes d$\sim$500 μm). An original backscattering, confocal optical system was developed for collecting Raman spectra. Stray laser light and Raleigh scattering were blocked by using a triple grating monochromator and spatial filters, designed specifically for these experiments. The optical system provided a spatial resolution of <100 μm. Gas temperatures were determined by matching experimental spectra to model spectra obtained by convolution of theoretical line intensities with the apparatus spectral resolution, with Tg as the adjustable parameter. T_g was determined as a function of pressure and discharge current density (P = 400-760 Torr, j_d = 200-1000 mA/cm^2). Midway between the electrodes, T_g increased linearly with j_d, reaching 500 K at 1000 mA/cm^2 j_d for a pressure of 720 Torr. Spatially resolved gas temperature measurements will also be presented and discussed in combination with a mathematical model for gas heating in the microplasma. This work is supported by DoE/NSF.

Sergey Belostotskiy
Dept. of Chemical Engineering, University of Houston

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