PERFORMANCE OF A CONTINUOUS SUPERSONIC EXPANSION DISCHARGE NOZZLE EVALUATED BY LASER-INDUCED FLUORESCENCE SPECTROSCOPY

KYLE N. CRABTREE, CARRIE A. KAUFFMAN, *Department of Chemistry, University of Illinois, Urbana, IL, 61801*; BENJAMIN J. MCCALL, *Departments of Chemistry and Astronomy, University of Illinois, Urbana, IL, 61801*.

We have recently constructed a prototype continuous supersonic expansion discharge nozzle for the production of rotationally cold molecular ions. To assess the performance of this source, we have employed laser-induced fluorescence spectroscopy to measure the rotational temperature distributions of I_2 and N_2^+ as a function of position within the expansion. These measurements are performed on the $B^3\Pi_{0_u^+} - X^1\Sigma_g^+$ (6-0), (8-1), (10-2), and (12-3) bands of I_2 at 608 nm and the $A^2\Pi_u - X^2\Sigma_g^+$ (4-0) band of N_2^+ at 614 nm using a tunable cw dye laser. The temperature distributions obtained act as a feedback mechanism that aids in refinement of the source design with the aim of optimizing the densities and temperatures of the species within the expansion.