HIGH RESOLUTION INFRARED CAVITY RINGDOWN SPECTROSCOPY WITH A PULSED, SLIT-JET DISCHARGE EXPANSION

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Recently we have exploited the technique of cavity ring-down spectroscopy (CRDS) to observe electronic spectra in the near infrared (NIR) of reactive chemical intermediates, including a number of organic peroxy radicals. These spectra have all been recorded at near ambient temperature at total pressures of a few hundred torr. Correspondingly rotational (and finer) structure has been poorly resolved, e.g., CH_3O_2, or not at all. A great deal more could be learned about the structure of these reactive intermediates via high-resolution, rotationally resolved, jet-cooled NIR CRDS. To this end we have constructed a pulsed, slit-jet discharge for producing rotationally cold species. The narrow bandwidth source of the NIR radiation is described in the succeeding talk. We have tested this apparatus with vibrational transitions (polyad 2) of H_2O and the highly forbidden $a^1\Delta_g - {}^3\Sigma_g^-$ O_2 transition. Initial measurements indicate rotational temperatures of ≈15K. Using the known cross-sections, we estimate a spectrometer sensitivity for absorption of 10ppb/cm. We have used the discharge to create OH radicals and observed the v= $2 \leftarrow 0$ vibrational overtone.