JET-COOLED CAVITY RING-DOWN SPECTROSCOPY OF THE $\tilde{A}^2 E''-\tilde{X}^2 A'$ VIBRONIC TRANSITION OF NO$_3$

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The three energetically lowest electronic states ($\tilde{X}^2 A'_2$, $\tilde{A}^2 E''$, and $\tilde{B}^2 E'$) of NO$_3$ are strongly coupled by vibronic interactions and have been treated in considerable detail theoretically. Corresponding experimental characterization of the interaction is much less detailed. Previous experimental results primarily consist of IR measurements of vibrational transitions in the ground state. In addition, the electronically forbidden $A-\tilde{X}$ transition has been observed in ambient temperature CRDS studies. A slit-jet nozzle with a high voltage pulsed discharge has been applied to produce the NO$_3$ radical by dissociating the N-O bond of N$_2$O$_3$, and the jet-cooled NO$_3$ CRDS absorption spectrum has been successfully observed with a high-resolution laser source ($\Delta \nu \approx 250$MHz, intrinsic resolution considering the instrumental linewidth and the residual Doppler broadening in the jet). The 4$_3^3$ band (parallel band) shows complex rotational structure which is presently being analyzed. The 2$_5^3$ band has also been measured as an example of a perpendicular band. Besides the $\nu_3$ and $\nu_4$ vibronic bands, the vibronically forbidden origin band (0$_0^0$ band) has been recorded under the same experimental conditions. The weakly observed $A-\tilde{X}$ origin band is likely either a magnetic dipole or an electric quadrupole transition.

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