# JET-COOLED LASER SPECTROSCOPY OF A JAHN-TELLER AND PSEUDO JAHN-TELLER ACTIVE MOLECULE: THE NITRATE RADICAL

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Well-known as an important intermediate in atmospheric chemistry, the nitrate radical ($NO_3$) has been extensively studied both experimentally and theoretically. The three energetically lowest electronic states ($\tilde{X}\ ^2A_2'$, $\tilde{A}\ ^2E''$, and $\tilde{B}\ ^2E'$) are strongly coupled by vibronic interactions and hence it is a textbook molecule for understanding the coupling between nearby potential energy surfaces. Such coupling has been treated in considerable detail theoretically.[a] However, corresponding experimental characterization of the interaction is much less detailed. The experimental results primarily consist of IR measurements of vibrational transitions in the ground state.[bc] In addition, the electronically forbidden $\tilde{A}$-$\tilde{X}$ transition has been observed in ambient temperature CRDS studies.[d] To understand both the Jahn-Teller and pseudo Jahn-Teller coupling in the molecule, further measurements are required with different selection rules and/or higher resolution to resolve the rotational structures of different transitions. In our group, a high-resolution (source $\Delta\nu \approx 100$ MHz in NIR region), jet-cooled CRDS system[e] can be applied to rotationally resolve the electronically forbidden $\tilde{A}$-$\tilde{X}$ transition. Furthermore, our high-resolution LIF/SEP system (source $\Delta\nu \approx 100$ MHz) can provide the direct, rotationally resolved measurements of the $\tilde{B}$-$\tilde{X}$ and $\tilde{B}$-$\tilde{A}$ transitions by operating in the LIF and SEP modes respectively. Such data can provide unambiguous spectral assignments in the $\tilde{X}$, $\tilde{A}$ and $\tilde{B}$ states.

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