LASER-INDUCED FLUORESCENCE STUDIES OF THE JET-COOLED CARBON DIOXIDE AND NITROUS OXIDE CATIONS

MOHAMMED A. GHARAIBEH and DENNIS J. CLOUTHIER, *Department of Chemistry, University of Kentucky, Lexington, KY 40506-0055.*

Laser-induced fluorescence (LIF) and single vibronic level (SVL) emission spectra of the $\tilde{A}^2\Pi_u$ - $\tilde{X}^2\Pi_g$ system of $^{12}CO_2^+$ and $^{13}CO_2^+$ and the $\tilde{A}^2\Sigma^+$ - $\tilde{X}^2\Pi$ system of N_2O^+ have been observed. The cations were produced in a pulsed electric discharge jet with a precursor mixture of the corresponding neutral molecule in high pressure argon. The LIF bands of $^{12}CO_2^+$ and $^{13}CO_2^+$ were partially rotationally analyzed to obtain band origins which yielded an accurate measure of the excited state vibronic energy levels. The energy levels of both isotopologues were fitted with a Renner-Teller model that included spin-orbit coupling, Fermi resonance and anharmonic terms. SVL emission spectra were also recorded for the $^{13}CO_2^+$ ion and the ground state energy levels fitted using the same Renner-Teller model. Due to excited state predissociation, only the low lying vibrational levels have been observed in the LIF spectrum of N_2O^+. Nitrous oxide cation SVL emission spectra were collected and a complete vibronic analysis of the $\tilde{X}^2\Pi$ electronic state has been carried out using the Renner-Teller model. Our experimental data provide rigorous tests for future *ab initio* potential energy surfaces of these important cations.