TIME-RESOLVED INFRARED DIODE LASER SPECTROSCOPY OF THE ν_1 BAND OF THE FeNO RADICAL PRODUCED BY THE ULTRAVIOLET LASER PHOTOLYSIS OF $Fe(CO)_2(NO)_2$

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Rovibrational transitions of the ν_1 band (N-O stretch) of the FeNO radical were observed in the 1750-1780 cm^{-1} region. The FeNO radical was produced by 193 nm excimer laser photolysis of $Fe(CO)_2(NO)_2$ and the transient absorption signal was detected by time-resolved infrared diode laser spectroscopy.
More than 40 lines were assigned to the ν_1 fundamental band of the $\Omega = 5/2$ spin component, together with ten Q-branch lines (J = 2.5 - 11.5) in the 1760 cm^{-1} region, to confirm the electronic ground state to be $X^2\Delta_i$. Effective molecular constants for the $\Omega = 5/2$ spin component, including the band origin ν_0 (1767.26093(38) cm^{-1}), the rotational constant B (4610.17754(93) MHz) and the centrifugal distortion constant D (1.17003(47) kHz), were derived from a least squares fitting of the observed transitions. The average bond length $r_{\mathrm{Co-N}}$ between Co and N was calculated to be 1.621 Å from the rotational constant B_0 assuming $r_{\mathrm{N-O}}$ =1.186 Å as given by $ab\,initio$ calculation[a]. The ν_1 hot band lines originated from the ν_2 (Fe-N-O bending; 308 cm^{-1} [a]) vibrationally excited state were also observed. Pure rotational lines of FeNO were also observed by the millimeter wave spectroscopy with the UV photolysis of $Fe(CO)_2(NO)_2$[b].

[a] M. Zhou and L. Andrews, $J.Phys.Chem.A$, **104**, 3915 (2000)
[b] Microwave session in this symposium.