REINVESTIGATION OF THE NCN RADICAL USING INFRARED LASER MAGNETIC RESONANCE SPECTROSCOPY

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The laser magnetic resonance (LMR) spectroscopic technique has been used to reinvestigate the generation and structure of the carbon-based free radical NCN. A liquid nitrogen-cooled carbon monoxide (CO) laser was used as a source of strong coherent radiation in the 1442 to 1469 cm^{-1} region of the infrared. The molecular transitions were brought into resonance with the laser frequency using magnetic fields up to 1.4 T. Using eleven CO laser emissions, spectra were recorded in both parallel ($\Delta M_J = 0$) and perpendicular ($\Delta M_J = \pm 1$) polarizations with over one hundred new absorption lines observed. Additionally, detuning experiments were performed on over forty new and previously observed absorption lines. Analysis of the 3_0^1 fundamental (near 1466.5 cm^{-1}) and $2_1^1 3_0^1$ hot band (near 1455.6 cm^{-1}) in the $^3\Sigma_g^-$ ground electronic state has led to the new assignment of LMR absorption lines as well as the reassignment of several LMR and Fourier transform lines belonging to NCN. The molecular parameters for NCN have been determined from a least squares fit of the Fourier transform and LMR spectra with a Hund's case (b) basis set truncated at $\Delta N = \pm 3$.

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