MEASUREMENT OF THE SIXTH OVERTONE BAND OF NITRIC OXIDE USING CAVITY-ENHANCED FREQUENCY MODULATION SPECTROSCOPY (NICE-OHMS)

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We applied cavity-enhanced frequency modulation absorption spectroscopy (also known as NICE-OHMS) to perform high-resolution spectroscopy of the sixth overtone band of nitric oxide near 797 nm. By using novel high-bandwidth balanced detectors, baseline variations caused by residual amplitude modulation were significantly reduced. The ultra-high sensitivity (2×10^{-10} cm^{-1} minimum detectable absorption at 1-Hz detection bandwidth) of our spectrometer allowed accurate measurements of 15 individual line intensities of P and R-branch transitions in the $^2\Pi_{1/2} \leftarrow {}^2\Pi_{1/2}$ sub-band. A vibrational transition moment of 3.09(6) μDebye $\pm$13 % and Herman-Wallis coefficients of a = -0.0078(26) and b = 0.00125(45) were found by fitting the line intensities. Based on our measured transition moment, and those of other transitions from the literature, a new parameterization for the electric dipole moment function (EDMF) of nitric oxide, valid between 0.91 and 1.74 Å, has been extracted. The residuals of this fit demonstrate that the derived EDMF is the most accurate representation to date of the dipole moment function. The new EDMF will be valuable for accurate intensity prediction of transitions that cannot be easily measured experimentally.