FIRST HIGH RESOLUTION ANALYSIS OF THE $5\nu_3$ BAND OF NITROGEN DIOXIDE NEAR 1.3 μm

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The first high-resolution absorption spectrum of the $5\nu_3$ band of the $^{14}N^{16}O_2$ molecule at 7766.071 cm^{-1} was recorded by high sensitivity CW-Cavity Ring Down Spectroscopy between 7674 and 7795 cm^{-1}. The noise equivalent absorption of the recordings was α_{min}=5 10^{-11}cm^{-1}. The assignments involve energy levels of the (0,0,5) vibrational state with rotational quantum numbers up to K_a=9 and N=47. The set of the spin-rotation energy levels were reproduced within their experimental uncertainty using a theoretical model which takes explicitly into account the Coriolis interactions between the spin rotational levels of the (0,0,5) vibrational state and those of the (0,2,4) dark state together with the electron spin-rotation resonances within the (0,0,5) and (0,2,4) states. Precise values were determined for the (0,0,5) vibrational energy rotational, spin-rotational constants and for the (0,2,4)↔(0,0,5) coupling constants. In addition the (0,2,4) vibrational energy and rotational, spin-rotational constants were estimated. Using these parameters and the value of the transition dipole moment operator determined from a fit of a selection of experimental line intensities, the synthetic spectrum of the $5\nu_3$ band was generated.