OBSERVATION OF TWO COMBINATION BANDS INVOLVING TORSION AND ASYMMETRIC BENDING MODES OF THE NON-POLAR N_2O DIMER

M. DEHGHANY, M. AFSHARI, N. MOAZZEN-AHMADI, *Department of Physics and Astronomy, 2500 University Drive NW, Calgary, ALberta T2N 1N4, Canada*; A.R.W. MCKELLAR, *Steacie Institute for Molecular Sciences, National Research Council of Canada, Ottawa, Ontario K1A OR6, Canada*.

The non-polar N_2O dimer has four low frequency intermolecular vibrational modes: van der Waals stretch (A_g symmetry), symmetric and asymmetric in-plane bends (A_g and B_u symmetry, respectively), and out-of-plane torsion (A_u symmetry). There are two possible intramolecular dimer vibrations which correlate with the ν_1 monomer stretch. One of these is an in-phase vibration of the two monomers, which has A_g symmetry and is not infrared active. The other is an out-of-phase vibration, which has B_u symmetry and gives rise to the infrared active dimer band at 2229.48 cm^{-1}. In the present work, we report the observation of an N_2O dimer band with c-type rotational structure, assigned as a combination of the A_g intramolecular N_2O ν_1 stretching vibration and the A_u intermolecular out-of-plane dimer torsional vibration. The vibrational origin for this band is measured to be 2249.360 cm^{-1}, giving an estimated torsional frequency of 21.5 cm^{-1}. A second combination band with a- and b-type rotational transitions has also been measured and assigned as the combination of the same A_g intramolecular vibration and the B_u asymmetric van der Waals bend. The measured band center is 2264.37 cm^{-1}, giving an asymmetric bending frequency of about 36.5 cm^{-1}. A search for the other two combination bands is currently underway.