MILLIMETER-WAVE SPECTRUM OF THE NO DIMER

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We are studying the pure rotational spectrum of the NO dimer, $(NO)_2$. The dimers are produced using a continuous supersonic jet source, and probed using a mm-wave spectrometer based on harmonic multiplication. Microwave radiation (75-100 GHz) from a Gunn oscillator is multiplied ($\times 3$ or $\times 4$) in a commercial tripler, focussed through the jet by teflon lenses, and detected by a helium-cooled InSb bolometer. The frequency scan and data collection are under microcomputer control. The computer also turns the jet off and on at intervals of 5 scans (about 5 sec), and automatically subtracts the background and sample spectra.

Previously, 4 rotational transitions of $(NO)_2$ in the 0 to 23 GHz microwave region had been reported.[a] Currently, we have measured about 80 new transitions in the frequency range from 227 to 382 GHz, with J values from 5 to 16, and K_a values from 2 to 8. The underlying ^{14}N hyperfine structure is partially resolved for some of the transitions. The observed line positions are quite well predicted by the existing molecular parameters from our analysis of the ν_1 infrared band,[b] but the new data will obviously allow a considerably more precise set of parameters to be derived. These new mm-wave results do not directly address the two great mysteries of the NO dimer, namely the locations of the intermolecular vibrational modes and of the low-lying electronic states. We still hope to address the former mystery by means of long-path, low temperature FT spectroscopy in the far-ir region.

[a] C.M. Western, P.R.R. Langridge-Smith, B.J. Howard, and S.E. Novick, Mol. Phys. 44, 145 (1981); S. Kukolich, J. Mol. Spectrosc. 98, 80 (1983).
[b] B.J. Howard and A.R.W. McKellar, Mol. Phys. 78, 55 (1993).