OD-N_2: INFRARED SPECTROSCOPY, POTENTIAL ANISOTROPY, AND PREDISSOCIATION DYNAMICS FROM IR-UV DOUBLE RESONANCE STUDIES

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The infrared spectrum of OD-N_2 has been obtained in the OD overtone region at 1.9 μm using an IR-UV double resonance technique. An optical parametric oscillator prepares OD-N_2 with two quanta of OD stretch, while an UV laser operating in the OD A-X 1-2 region promotes OD-N_2 ($2\nu_{\mathrm{OD}}$) to the excited A electronic state, resulting in a laser-induced fluorescence signal. A rotationally resolved infrared spectrum of the pure overtone band of OD-N_2 has been observed at 5174.0 cm^{-1}, shifted 0.7 cm^{-1} to lower energy than the OD monomer Q(3/2) line. Analysis of the rotational structure reveals a P = 3/2 projection of the total angular momentum along the intermolecular axis originating from the unquenched electronic angular momentum of OD in a linear OD-N_2 complex. A lifetime of approximately 140 ns has been measured for OD-N_2 ($2\nu_{\mathrm{OD}}$) by varying the time delay between the IR and UV lasers. In addition, two combination bands, involving OD stretch and geared bend excitation, have also been identified 35.1 and 40.6 cm^{-1} to higher energy of the pure overtone band. A surprising decrease in lifetime has been observed upon excitation of one of the combination bands. The OD-N_2 observations will be compared with previous results for OH-N_2 to provide detailed information on the anisotropy of the intermolecular potential and the vibrational predissociation mechanism.

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