TUNNELING DYNAMICS IN $N_2 - D_2O$ OBSERVED IN THE OD STRETCHING REGION

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The rovibrational spectra of $N_2 - D_2O$ and $N_2 - DOH$ were measured around the OD stretching region. A combination band involving the in-plane N_2 bend intermolecular vibration was also observed in the same frequency range. These bands were measured at the University of Calgary using a pulsed-slit supersonic jet expansion and a mid-infrared tunable optical parametric oscillator. The spectra were analyzed by considering the feasible tunneling motions and fit to a series of independent asymmetric rotors. The rotational constants of the four tunneling components of $N_2 - D_2O$ were retrieved for the excited vibrational states. Small vibrational blue shifts of $0.6\ cm^{-1}$ and $1.8\ cm^{-1}$ compared to the D_2O monomer band origins were determined for the symmetric and asymmetric stretches, respectively. A two order of magnitude larger tunneling splittings is observed for the asymmetric OD stretching excitation compared to the symmetric one. This last finding indicate a significant change of the intermolecular dynamics due to the intramolecular asymmetric OD vibration.