HIGH-RESOLUTION ROTATIONAL SPECTROSCOPY OF NITROUS OXIDE SOLVATED BY HYDROGEN MOLECULES

JEN NICOLE LANDRY AND WOLFGANG JÄGER, *Department of Chemistry, University of Alberta, Edmonton, AB, T6G 2G2, Canada*.

A linear molecule nitrous oxide (N_2O) was systematically solvated by hydrogen molecules (both $ortho$-H_2 and $para$-H_2 spin isomers) and investigated using high-resolution microwave spectroscopy. Clusters containing combinations of spin isomers, i.e. $(ortho H_2)_N$-N_2O, $(ortho\text{-}H_2)_{N-M}(para\text{-}H_2)_N$-$N_2O$ and $(para\text{-}H_2)_N$-N_2O, were measured using a pulsed molecular beam, Balle-Flygare type Fourier transform microwave spectrometer. The assignment of N, the number of solvating hydrogen molecules, is supported by the pressure and concentration dependencies of the line intensities and by the previous infrared work by Tang and McKellar [J. Chem. Phys. **123**, 114314 (2005)]. The nuclear spin-spin hyperfine structures arising from the $ortho$-H_2 molecules could be resolved and used to determine trends in the structural and dynamical properties of the clusters. The moments of inertia smoothly increase from N = 1 to 12. Further solvation of the nitrous oxide molecule with additional $para$-H_2 molecules is required to detect the possible onset of "molecular superfluidity".