INFRARED SPECTROSCOPY OF NOH SUSPENDED IN SOLID PARAHYDROGEN: PART TWO

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The only report in the literature on the infrared spectroscopy of the parent oxynitrene NOH was performed using Ar matrix isolation spectroscopy at 10 K.[a] In this previous study, they performed detailed isotopic studies to make definitive vibrational assignments. NOH is predicted by high-level calculations to be in a triplet ground electronic state,[b] but the Ar matrix isolation spectra cannot be used to verify this triplet assignment. In our 2013 preliminary report,[c] we showed that 193 nm in situ photolysis of NO trapped in solid parahydrogen can also be used to prepare the NOH molecule. Over the ensuing two years we have been studying the infrared spectroscopy of this species in more detail. The spectra reveal that NOH can undergo hindered rotation in solid parahydrogen such that we can observe both a-type and b-type rovibrational transitions for the O-H stretch vibrational mode, but only a-type for the mode assigned to the bend. In addition, both observed a-type infrared absorption features (bend and OH stretch) display fine structure; an intense central peak with weaker peaks spaced symmetrically to both lower and higher wavenumbers. The spacing between the peaks is nearly identical for both vibrational modes. We now believe this fine structure is due to spin-rotation interactions and we will present a detailed analysis of this fine structure. Currently, we are performing additional experiments aimed at making ^{15}NOH to test these preliminary assignments. The most recent data and up-to-date analysis will be presented in this talk.

[a] G. Maier, H. P. Reisenauer, M. De Marco, *Angew. Chem. Int. Ed.* **38**, 108-110 (1999).

[b] U. Bozkaya, J. M. Turney, Y. Yamaguchi, and H. F. Schaefer III, *J. Chem. Phys.* **136**, 164303 (2012).

[c] David T. Anderson and Mahmut Ruzi, *68th Ohio State University International Symposium on Molecular Spectroscopy*, talk TE01 (2013).