INFRARED SPECTROSCOPY OF HNO AND NOH SUSPENDED IN SOLID PARAHYDROGEN

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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, the NOH is synthesized by co-deposition of NO/Ar and a $H_2$/Ar mixture that is passed through a microwave discharge to create H-atoms. The H-atoms recombine with NO in the Ar matrix to produce mostly HNO, but some NOH is produced as well. In this work we irradiate NO doped parahydrogen solids at 2 K using 193 nm radiation which is known to generate H-atoms as by-products.[b] After the photolysis laser is stopped, we detect growth of HNO and NOH presumably due to reactions of H-atoms with NO analogous to the previous Ar matrix study. The higher energy NOH isomer is predicted by high-level calculations to be in a triplet ground electronic state.[c] Interestingly, the infrared absorptions of NOH for the two observed vibrational modes (bend and OH stretch) display fine structure; an intense central peak with smaller peaks spaced symmetrically to both lower and higher wavenumbers. Further, the spacing between the peaks is the same for both vibrational modes. We believe this fine structure reflects the zero-field splitting of the triplet ground state of NOH (magnetic dipole-dipole interaction) and our most current results and analysis will be presented.

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[a] G. Maier, H. P. Reisenauer, M. De Marco, *Angew. Chem. Int. Ed.* **38**, 108-110 (1999).
[b] M. Fushitani and T. Momose, *Low Temp. Phys.* **29**, 740-743 (2003).
[c] U. Bozkaya, J. M. Turney, Y. Yamaguchi, and H. F. Schaefer III, *J. Chem. Phys.* **136**, 164303 (2012).