ANOMALOUS Λ-DOUBLING IN THE INFRARED SPECTRUM OF THE HYDROXYL RADICAL IN HELIUM NANODROPLETS

P. RASTON, T. LIANG, and G. E. DOUBERLY, *Department of Chemistry, University of Georgia, Athens, Georgia 30602, USA*.

The $X^2\Pi_{3/2}$ hydroxyl (OH) radical has been isolated in superfluid ^{4}He nanodroplets and probed with infrared laser depletion spectroscopy. From an analysis of the Stark spectrum of the $Q(3/2)$ transition, the Λ-doublet splittings are determined to be 0.198(3) cm^{-1} and 0.369(2) cm^{-1} in the ground and first excited vibrational states, respectively. These splittings are 3.6 and 7.2 times larger than their respective gas phase values. A factor of 1.6 increase in the $Q(1/2)$ Λ-doublet splitting was previously reported for the helium solvated $X^2\Pi_{1/2}$ NO radical [K. von Haeften, A. Metzelthin, S. Rudolph, V. Staemmler, and M. Havenith, Phys. Rev. Lett. 95, 215301 (2005)]. A simple model is presented that predicts the observed Λ-doublet splittings in helium solvated OH and NO. The model assumes a small parity dependence of the rotor's effective moment of inertia and predicts a factor of 3.6 increase in the OH ground state (J=3/2) Λ-doubling when the B_0^e and B_0^f rotational constants differ by less than one percent.