THE PURE ROTATIONAL SPECTRUM OF ZnOD AND THE STRUCTURE OF ZnOH (X^2A'):

L.N.ZACK, B.J.HARRIS, M.P.BUCCHINO and L. M. ZIURYS, *Department of Chemistry, Department of Astronomy, and Steward Observatory, University of Arizona, Tucson, AZ, 85721.*

The pure rotational spectrum of ZnOD in its (X^2A') state has been measured using millimeter/submillimeter direct absorption spectroscopy. The molecule was synthesized by reacting zinc vapor with D_2O under DC discharge conditions. The K-ladder structure characteristic of asymmetric tops has been clearly observed in the zinc isotopologues ^{64}ZnOD, ^{66}ZnOD, and ^{68}ZnOD, just as in the ZnOH species. A spin-rotation splitting of $\sim$170-180 MHz for ZnOD is observed for each K component. Constants were obtained by fitting the data to a Watson s-reduced Hamiltonian. Measurement of the ZnOD spectrum, has allowed for a complete r_0 and $r_m^{(1)}$ structure determination for ZnOH. The $r_m^{(1)}$ bond length for Zn-O is 1.7945 Å and 0.9669 Å for O-H, respectively. The Zn-O-H bond angle is 114.2 degrees. We are initiating a study using Fourier transform microwave spectroscopy in order to measure the hyperfine structure due to the hydrogen. The spectral analysis of ZnOD will be presented, as well as conclusions about the structure of ZnOH.