THE PURE ROTATIONAL SPECTRUM OF THE ZnSH RADICAL (X^2A')

MATTHEW P. BUCCHINO , GILLES R. ADANDE and LUCY M. ZIURYS, *Department of Chemistry and Biochemistry, Department of Astronomy, and Steward Observatory, University of Arizona, Tucson, Arizona 85721*.

The pure rotational spectrum of the ZnSH radical (X^2A') has been observed in the laboratory for the first time using millimeter/submillimeter direct-absorption methods and Fourier-transform microwave (FTMW) techniques in a frequency range of 4-400GHz. ZnSH was synthesized by reacting zinc vapor with H_2S under DC discharge in a Broida-type oven for the millimeter work; in the FTMW studies, the radical was created by discharge assisted laser ablation spectroscopy (DALAS) using 0.5% H_2S in Ar and a zinc rod. The K-ladder structure indicates C_s symmetry, and therefore a bent molecule. Spectra of multiple isotopologues have been recorded (^{64}ZnSH, ^{66}ZnSH, ^{68}ZnSH, and ^{64}ZnSD), from which an r_0 structure has been determined. Each K-component consists of spin-rotation doublets with a splitting of 130-140MHz. Proton hyperfine structure was observed in the FTMW data. Rotational, spin-rotation, and hyperfine constants have been determined from a global fit to the data. Although ZnSH and ZnOH are isovalent, there appear to be subtle differences in bonding between the two species.