THE SUBMILLIMETER AND MICROWAVE SPECTRA OF HZnCl (X $^1\Sigma^+$)

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The pure rotational spectra of HZnCl ($^1\Sigma^+$) has been studied using submillimeter-wave direct-absorption and Fourier transform microwave (FTMW) methods. This species was produced by the reaction of zinc vapor and Cl_2 in the presence of H_2 and a d.c. discharge for the millimeter studies. For the FTMW measurements, HZnCl was made by the reaction of chlorine gas and $Zn(CH_3)_2$ in a d.c. discharge created in the supersonic nozzle. The spectra of seven isotopologues were recorded including the deuterium substituted species. We were able to obtain the rotational constants of B_0 and D_0 for each isotopologue. Using the FTMW data, we observed the hyperfine components of the lower J transitions and determined the chlorine quadrupole constant. For HZnCl, the average Zn-Cl bond length was determined to be 2.083153(21) $\AA$ with the H-Zn bond length equal to 1.51909(38) $\AA$. From HZnCl to its open shelled counterpart ZnCl, the bond length was found to contract by 0.05 $\AA$ suggesting that the hydrogen stabilizes the molecule.