

THE PURE ROTATIONAL SPECTRUM OF ZnCl ($X^2\Sigma^+$)

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The radical ZnCl has been studied with high-resolution millimeter-wave spectroscopy in its $^2\Sigma^+$ ground state. Pure rotational spectra of $^{64}\text{Zn}^{35}\text{Cl}$, $^{64}\text{Zn}^{37}\text{Cl}$, and $^{66}\text{Zn}^{35}\text{Cl}$ were measured in the ground and excited vibrational states ($v=1,2$), and measurements of $^{67}\text{Zn}^{35}\text{Cl}$, $^{66}\text{Zn}^{37}\text{Cl}$, and $^{68}\text{Zn}^{35}\text{Cl}$ were recorded in the ground state. Each rotational transition was found to be split into doublets by spin-rotation interactions, and for $^{67}\text{Zn}^{35}\text{Cl}$, hyperfine splittings due to the nuclear spin of ^{67}Zn ($I=5/2$) were also observed. Rotational, fine structure, and hyperfine constants have been determined from these data, and equilibrium parameters calculated. The equilibrium bond length of $^{64}\text{Zn}^{35}\text{Cl}$ was found to be $2.13003(57)\text{\AA}$, in good agreement with recent theoretical predictions. Interpretation of the hyperfine constants indicates that the ZnCl bond is mostly ionic.