THE 3d BROMIDE SERIES: THE PURE ROTATIONAL SPECTRUM OF CrBr ($X^6\Sigma^+$)

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The millimeter-wave spectrum of the high spin radical chromium bromide, CrBr, in its $X^6\Sigma^+$ state has been measured using direct absorption methods between 220-300 GHz. The radical was created in a DC discharge by the reaction of dibromomethane with chromium vapor, produced in a Broida-type oven. This study is the first measurement of CrBr by any spectroscopic technique. Eight rotational transitions of four isotopologues ($^{52}Cr^{79}Br$, $^{52}Cr^{81}Br$, $^{53}Cr^{79}Br$, and $^{53}Cr^{81}Br$) of this radical were recorded in the ground vibrational state, each consisting of fine structure sextets with additional bromine hyperfine splitting. Spectra were also obtained for the v=1 and v=2 states of $^{52}Cr^{81}Br$ and $^{52}Cr^{79}Br$. The data were fit with a Hund's case b Hamiltonian and rotational, spin-spin, spin-rotation and hyperfine parameters were determined, including the higher order spin terms γ_s and Θ. The hyperfine constants indicate that CrBr has a significant covalent component to its bonding, unlike its chlorine and fluorine counterparts.