

## THE SUBMILLIMETER-WAVE SPECTRUM OF THE CrH AND CrD ( ${}^6\Sigma^+$ ) RADICALS

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The  $N = 0 \rightarrow 1$  transition of CrH and the  $N = 1 \rightarrow 2$  line of CrD in their  ${}^6\Sigma^+$  ground states have been recorded using sub-millimeter direct absorption techniques. This study was the first direct measurement of these transitions. These molecules were produced in a discharge plasma of chromium vapor and  $\text{H}_2$  or  $\text{D}_2$  gas. Three fine structure components were measured for each radical, and the proton and deuteron hyperfine splittings were also resolved. Spectroscopic constants were obtained by fitting the data with a Hund's case (b) Hamiltonian including rotation, spin-rotation, spin-spin, magnetic hyperfine, and electric quadrupole interactions. These measurements have resulted in improved spectroscopic constants for both isotopomers. The hyperfine parameters suggest that the bonding in CrH has a nonnegligible covalent character. This molecule may be present in the outer envelope of late-type stars and formed by ion-molecule reactions from neutral or ionized Cr and hydrogen gas. Chromium has a cosmic abundance of  $\text{Cr}/\text{H} = 5 \times 10^{-7}$ .