THE ELECTRONIC SPECTRUM OF $CoCl_2$ IN THE GAS PHASE

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The 310 nm uv band system of the $CoCl_2$ radical has been recorded at high resolution by laser excitation spectroscopy. (The experimental details are described in full elsewhere [a]). The molecule was formed in the high temperature reaction between HCl(g) and cobalt metal and was cooled to a rotational temperature of about 10K in a subsequent free-jet expansion. This work confirms earlier observations by DeKock and Gruen[b] and provides much more structural information. Excited state vibrational progressions of approximately 200 cm^{-1} have been identified and tentatively assigned to the symmetric stretching vibration. Rotational analyses of the three longest wavelength bands reveal that the lower and upper electronic states both have $\Omega = 7/2$; this is consistent with recent *ab initio* calculations which predict a $^4\Delta$ ground state [c]. The following rotational constants were determined for the (200) band: $B'' = 0.056432(81)$ cm^{-1}, $B' = 0.04951(10)$ cm^{-1}. A study by dispersed fluorescence shows progressions in the ground state symmetric stretching vibration (360 cm^{-1}). This is very similar to the value determined for other transition metal dichlorides [d]. Note that the suggested value for ν_1 in the excited state is much smaller than this.

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[b] C. W. DeKock and D. M. Gruen, *J. Chem. Phys.*, **44,** 4387, (1966).
[c] V. V. Sliznev, N. Vogt, and J. Vogt, *The Eighteenth Colloquium on High Resolution Molecular Spectroscopy, Dijon* , Poster O4, (2003).
[d] F. J. Grieman, S. H. Ashworth, and J. M. Brown, *J. Chem. Phys.*, **92,** 6365, (1990).