

LASER SPECTROSCOPY OF IRIDIUM MONOCHLORIDE

COLAN LINTON, *Department of Physics, University of New Brunswick, Fredericton, NB, Canada*; ALLAN G. ADAM, SAMANTHA FORAN, *Department of Chemistry, University of New Brunswick, Fredericton, NB, Canada*; TONGMEI MA, TIMOTHY STEIMLE, *Department of Chemistry and Biochemistry, Arizona State University, Tempe, AZ, USA*.

Iridium monochloride (IrCl) molecules have been produced in the gas phase using laser ablation sources at the University of New Brunswick (UNB) and Arizona State University (ASU). Low resolution laser induced fluorescence (LIF) spectra, obtained at UNB using a pulsed dye laser, showed three bands at 557, 545 and 534 nm which appeared to form an upper state vibrational progression. Dispersed fluorescence (DF) spectra, obtained by exciting each band at its band head frequency, showed a ground state vibrational progression extending from $v=0$ to 6. High resolution spectra (FWHM=0.006 cm^{-1}), taken using a cw ring dye laser, showed resolved rotational lines, broadened by unresolved Ir ($I=3/2$) hyperfine structure, in both the $^{193}\text{Ir}^{35}\text{Cl}$ and $^{191}\text{Ir}^{35}\text{Cl}$ isotopologues. Vibrational assignments of 0-0, 1-0 and 2-0 for the three bands were determined from the isotope structure and the rotational analysis showed the transition to be ${}^3\Phi_4 - {}^3\Phi_4$, similar to that previously observed in IrF. Higher resolution spectra (FWHM=0.001 cm^{-1}) of the 1-0 band, obtained at ASU, showed resolved hyperfine structure from which the magnetic and quadrupole hyperfine parameters in the ground and excited states were determined. The interpretation of the hyperfine parameters in terms of the electron configurations will be presented along with a comparison of the properties of IrCl and IrF.