A SPECTROSCOPIC STUDY OF THE LINEAR-BENT ELECTRONIC TRANSITIONS OF JET-COOLED BCl_2 AND HBCl

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Laser induced fluorescence (LIF) and single vibronic level emission spectra (SVL) of jet-cooled BCl_2 and HBCl have been measured. The radicals were produced in a pulsed electric discharge of a mixture of BCl_3/Ar and BCl_3/H_2/Ar, respectively. The LIF spectra of both radicals are congested due to overlapping bands from the boron and chlorine isotopes. In addition, the ground and first excited states are the two Renner-Teller components of a $^2\Pi$ state split by a strong vibronic interaction. The Franck-Condon profile of the $\tilde{A}^2B_1$ - $\tilde{X}^2A_1$ band system of BCl_2 and the $\tilde{A}^2A''$ - $\tilde{X}^2A'$ system of HBCl are characteristic of linear-bent excitations. Excited state bending progressions have been identified in both species using the LIF-sync scan procedure in which the monochromator is offset by a value corresponding to a ground state fundamental frequency of the target molecule and scanned simultaneously with the dye laser. LIF spectra of individual isotopes can thus be recorded. Ground state vibrational frequencies have been deduced from SVL spectra. The emission spectra for BCl_2, are dominated by progressions in the symmetric stretching (ν_1) and bending (ν_2) modes. In the case of HBCl, progressions in the bending (ν_2) and BCl stretching (ν_3) modes were observed.