THE ELECTRONIC SPECTRA OF THE JET-COOLED BORON DIFLUORIDE (BF_2) AND BORON DICHLORIDE (BCl_2) FREE RADICALS

JIE YANG, JIE WEI, FUMIE SUNAHORI, MOHAMMED GHARAIBEH, BLAINE ELLIS, ALFRED CHEN, and DENNIS J. CLOUTHIER, *Department of Chemistry, University of Kentucky, Lexington, KY 40506-0055, USA*; SHENG-GUI HE, *Beijing National Laboratory for Molecular Sciences, State Key Laboratory for Structural Chemistry of Unstable and Stable Species, Institute of Chemistry, The Chinese Academy of Sciences, Zhongguancun, Beijing 100080, PRC*.

Laser-induced fluorescence (LIF) and single vibronic level (SVL) emission spectra of the $\tilde{A}^2\Pi_u - \tilde{X}^2A_1$ transitions of the jet-cooled boron difluoride (BF_2) and boron dichloride (BCl_2) radicals have been observed. In each case, the radical was produced in a pulsed discharge jet using a precursor mixture of the corresponding boron halide (BF_3 or BCl_3) in high pressure argon. Due to a large change in geometry from a bent ground state to a linear excited state, the LIF spectra are very extensive and the emission spectra show long bending progressions. Strong LIF bands of $^{11}BF_2$ and $^{10}BF_2$ (from isotopically enriched $^{10}BF_3$) were observed in the $29200 - 35100$ cm^{-1} region and isotope shifts were identified. The rotational constants obtained from high resolution LIF spectra of the two isotopologues were used to determine the effective zero-point structure of the ground state. For BCl_2, weaker and much more complex LIF spectra, which have as yet defied vibrational analysis, were recorded in the $15300 - 22700$ cm^{-1} region. SVL emission spectra of five isotopologues have been obtained, affording a detailed vibrational analysis of the ground state of BCl_2.