HIGH RESOLUTION FOURIER TRANSFORM EMISSION SPECTROSCOPY OF THE $\tilde{A}^2\Sigma^+ - \tilde{X}^2\Pi$ TRANSITION OF THE $BrCN^+$ ION

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The $BrCN^+$ ion was produced by Penning ionization of BrCN with metastable He^*, and the near-infrared emission in the 690 - 870 nm region was measured by Fourier transform spectrometer. Thirteen vibronic bands of the $\tilde{A}^2\Sigma^+ - \tilde{X}^2\Pi$ transition of $^{79}BrCN^+$ and $^{81}BrCN^+$ were observed. The rotational analysis was performed for the $\tilde{A}^2\Sigma^+(000) - \tilde{X}^2\Pi_\Omega(000)$ and $\tilde{A}^2\Sigma^+(000) - \tilde{X}^2\Pi_\Omega(010)$ transitions, both for the $\Omega = 3/2$ and 1/2 spin components.

Molecular constants, including the effective rotational constant, centrifugal distortion constant, Λ-type doubling constant in the $\tilde{X}^2\Pi_{1/2}$ state, and spin-rotation interaction constant in the $\tilde{A}^2\Sigma^+$ state, were determined from the observed spectrum. Spin-orbit interaction constants for the $\tilde{X}^2\Pi$ ground state were determined to be $-$1476.4669(48) and $-$1476.4841(60) cm^{-1}, respectively, for $^{79}BrCN^+$ and $^{81}BrCN^+$. The r_0-structures for the $\tilde{X}^2\Pi$ and $\tilde{A}^2\Sigma^+$ states of $BrCN^+$ were derived to be compared with that for the $\tilde{X}^1\Sigma^+$ state of BrCN. The geometrical change of the $BrCN^+$ ion from the BrCN molecule was turned out to be small.

Due to the Renner-Teller effect, the $\tilde{X}^2\Pi$(010) state was split into four components, $\mu^2\Sigma$, $\kappa^2\Sigma$, and $^2\Delta_P$ ($P = 5/2$ and 3/2), and the rotational analysis was performed both for the $\tilde{A}^2\Sigma^+ - \mu^2\Sigma$ and $\tilde{A}^2\Sigma^+ - \kappa^2\Sigma$ transitions. For the $\mu^2\Sigma$ and $\kappa^2\Sigma$ vibronic states, Ω-type doubling constants were determined as well as the rotational constants and centrifugal distortion constants. Renner parameter ϵ for the $\tilde{X}^2\Pi$ state was determined to be -0.185 from the Ω-type doubling constants for both the isotopic species.