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

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The visible and near infrared emission spectrum in the 480 - 900 nm region of ICN^+ was measured by Fourier transform spectrometer (Bruker IFS 120HR). The ICN^+ was produced by Penning ionization of ICN with metastable He*. The ICN^+ ion has much larger spin-orbit interaction constant ($A = -4343\mathrm{cm}^{-1}$) than those of the $\mathrm{ClCN}^+(-276\mathrm{cm}^{-1})$ and the $\mathrm{BrCN}^+(-1477\mathrm{cm}^{-1})$[a]. The Renner-Teller effect appears in the ν_2 excited state of $\tilde{X}^2\Pi$. It is interesting to study the Renner-Teller effect of ICN^+. Eight vibronic bands of the $\tilde{A}^2\Sigma^+ - \tilde{X}^2\Pi$ transition (both for the $\Omega = 1/2$ and $3/2$ spin components) of ICN^+ were observed. So far, the rotational analysis was performed for two vibronic bands, $\tilde{A}^2\Sigma^+(000) - \tilde{X}^2\Pi_{3/2}(000)$ and $\tilde{A}^2\Sigma^+(000) - \mu^2\Sigma(010)$. Molecular constants, including the band origin, the effective rotational constant, centrifugal distortion constant and spin-rotation interaction constant, were determined for the $\tilde{A}^2\Sigma^+$ and $\tilde{X}^2\Pi_{3/2}$ states.

Due to the Renner-Teller effect, the $\tilde{X}^2\Pi(010)$ state was split into four vibronic components, $\mu^2\Sigma$, $\kappa^2\Sigma$, and ${}^2\Delta_P(P = 3/2$ and $P = 5/2)$. For the $\tilde{A}^2\Sigma^+ - \mu^2\Sigma$ band, P_1, P_2, R_1 and R_2-branch were observed. For the $\mu^2\Sigma$ vibronic state, Ω-type doubling constant was determined as well as the rotational constant and centrifugal distortion constant. Renner parameter ϵ for the $\tilde{X}^2\Pi$ state was determined to be -0.197 from the Ω-type doubling constant. The determined Renner parameter ($\epsilon = -0.197$) was close to that of $\mathrm{BrCN}^+(-0.185)$. We are now analyzing the spectrum for the $\Omega = 1/2$ spin component, $\tilde{A}^2\Sigma^+(000) - \tilde{X}^2\Pi_{1/2}(000)$ and $\tilde{A}^2\Sigma^+(000) - \kappa^2\Sigma(010)$, to study the Renner-Teller effect in more detail.

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[a] J. Fulara *et al.*, *J. Phys. Chem.*, **89**, 4213-4219, (1985)