HOT BANDS OF $HCNH^+$ AND HCO^+ IN THE 3 μm REGION

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Protonated hydrogen cyanide, $HCNH^+$, and protonated carbon monoxide, HCO^+, are very abundant in ionized environments containing hydrogen, carbon, and either nitrogen or oxygen and are observed in many molecular clouds by radio astronomy. In the laboratory, the fundamental bands of these molecular ions are often detected in positive column discharges, even when nitrogen and oxygen are only present as impurities. Furthermore, in He dominated discharges, these ions are produced in highly excited vibrational states. Assignment of the hot bands of these molecular ions is an important step in the search for the less-intense absorptions of other ions.

In 2002 we recorded the spectrum of highly excited $HCNH^+$ (3000–3600 cm^{-1}) in a water-cooled discharge of CH_4, N_2, H_2, and He.[b] This spectrum was recorded with our color-center laser spectrometer which couples velocity modulation and heterodyne detection for near shot-noise-limited sensitivity. Since then, the high resolution spectrum of highly excited HCO^+ (3000–3200 cm^{-1}) was recorded with the same spectrometer. HCO^+ was produced in a water-cooled discharge of CO, H_2, and He. In this paper, we present the final analysis of the $HCNH^+$ spectrum and a comparable analysis of the HCO^+ spectrum. For HCO^+, a global fit of the new lines with all previous laboratory data will be presented as well.

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[b]C. M. Lindsay, C. F. Neese, and T. Oka, 57th International Symposium on Molecular Spectroscopy, The Ohio State University (2002).