OBSERVATION OF THE B $^6\Pi$ STATE OF CrH IN A VERNIER-FILTERED FREQUENCY COMB ABSORPTION EXPERIMENT

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A cavity-enhanced absorption spectrum of CrH, recorded using a mode-locked Ti:sapphire laser as a light source, shows hitherto unassigned (and irregularly spaced) features around 775 nm, in the region of the (1–0) P branches of the A $^6\Sigma^+$–X $^6\Sigma^+$ system. They are indicated with dots in the figure shown below, and are tentatively assigned as B $^6\Pi_{7/2}$–X $^6\Sigma^+$ transitions. These assignments place the 7/2 spin component of the B state about 12900 cm^{-1} above the lowest level of the electronic ground state.

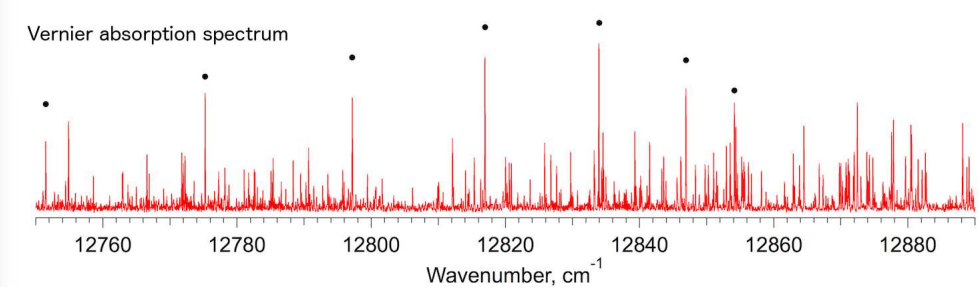

Figure 1: Marked features do not belong to the A-X (1-0) band of CrH, and are assigned as P_1 lines of the B-X system.

CrH was formed in a DC discharge sputter source, fitted with a pierced cathode made of iron/chromium alloy. A continuous flow of H_2 in argon passed through the cathode into a vacuum chamber with high reflectance mirrors mounted on its side-arms. Placed at the centre of this high-finesse (F=16000) optical cavity, the source produced a plume about 1 cm wide, which was probed by the laser beam. Transmission through the optical cavity was recorded on a split photodiode, using a Vernier filtering scheme[1] to achieve fast, broadband coverage close to Doppler resolution. Several spectra were averaged and concatenated to cover the region 12500–13100 cm^{-1}, providing relative intensity information. Some lines were also recorded in cw laser excitation, offering a cleaner baseline and giving some reference calibration for the Vernier spectrum, as part of a search for weaker (satellite) transitions needed to confirm our assignments.

[1] Lu et al Photonics 9 222 (2022)

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