HIGH RESOLUTION INFRARED SPECTROSCOPY OF THE HCN-(o-H_2) AND HCN-(p-D_2) CLUSTERS IN THE GAS PHASE

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High resolution infrared spectra of of the HCN-(o-H_2) and -(p-D_2) in the gas phase have been observed and analyzed for the first time. Spectra for the CH-stretching band were recorded by using a color center laser spectrometer combined with molecular beam opto-thermal detection. No spectra for HCN-(p-H_2) and HCN-(o-D_2) were observed. The observed spectra for HCN-(o-H_2) and (p-D_2) show a typical pattern for parallel band of a linear molecule. Since the Q-branches were absent and the $R(0)$ lines were observed, these bands were assigned to $\Sigma - \Sigma$ bands. The rotational constants, B_0, obtained from Dopplar free spectra (FWHM = 20 MHz) were 0.43025(18) cm^{-1} and 0.26630(8) cm^{-1} for HCN-(o-H_2)$_1$ and for -(p-D_2)$_1$, respectively. For both species, the line broadening due to vibrational predissociation has not been observed. The vibrational frequencies for the vdW stretching mode were derived to be 30.2 cm^{-1} and 28.4 cm^{-1} for HCN-(o-H_2) and -(p-D_2), respectively.