CAVITY RINGDOWN SPECTROSCOPY OF HC$_7$H AND HC$_9$H

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Vibronic bands of the $^3\Sigma^+ \leftrightarrow ^3\Sigma^-$ transitions of linear HC$_7$H and HC$_9$H have been detected in the gas phase using cavity ringdown spectroscopy in the wavelength range 500-600 nm. The $\Omega_6$ bands of both molecules, as well as an additional vibronic band of HC$_9$H, were measured. Both molecules were produced in a DC discharge through a dilute mixture of diacetylene in Ar in the throat of a supersonic nozzle. The identifications were confirmed by detecting the singly and doubly deuterated species of both molecules, and by comparison with previous matrix data. Neither molecule could be detected by laser-induced fluorescence. Each band exhibits expected P- and R-branches, and the band origins have been measured to 0.1 cm$^{-1}$ or better. For HC$_9$H, the wavelength of the $\Omega_6$ band agrees to within one part in $10^4$ with that of the weak diffuse interstellar band at 581.86 nm. Astronomical verification of this assignment could be achieved by detecting the expected P- and R-branches in the DIB, or by detecting the somewhat weaker $\Omega_8$ band at 521.91 nm.