

INVESTIGATION OF J-DEPENDANCE OF LINE SHIFT AND LINE BROADENING IN THE $\nu_1+3\nu_3$ BAND OF ACETYLENE

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Line shift and line broadening coefficients $\delta\nu$ and γ have been measured for 21 rotational lines of the P and R branch of the $\nu_1+3\nu_3$ band of acetylene at 789 nm using a tunable cw semiconductor laserdiode system. The absorption cell was of the multi-pass Herriot-type with an effective absorption length of 35 m. Up to now, self-broadening and broadening by N₂, Ar and air perturbers have been investigated. Taking air-broadening as an example we obtained $\gamma = 0.176(12) \text{ cm}^{-1}/\text{bar}$ and $\delta\nu = 0.012(2) \text{ cm}^{-1}/\text{bar}$ for the P(4) line. With increasing value of J the values of γ decrease, e.g. to $0.147(2) \text{ cm}^{-1}/\text{bar}$ for R(13) whereas $\delta\nu$ increases to $0.016(2) \text{ cm}^{-1}/\text{bar}$. A similar behaviour has been observed for the case of other foreign gas perturbers and for self-broadening. The present investigation might be of interest for the reliable detection of small amounts of acetylene in air of atmospheric pressure. In our system we could detect a minimal concentration of 1 μbar acetylene in a N₂ atmosphere of 15 mbar pressure.