CONCENTRATION DEPENDENCE OF LINE SHAPES IN THE $\nu_1 + \nu_3$ BAND OF ACETYLENE

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Using an extended cavity diode laser locked to a frequency comb, the line shape of the P(11) line in the $\nu_1 + \nu_3$ combination band of acetylene has been studied as a function of varying concentration of the absorber in nitrogen. Mixture concentrations of 1, 5 and 10% at 296 K and pressures between a few Torr and one atmosphere were made and the measurements analyzed using two different speed-dependent broadening models. These experiments are designed to test the additivity of contributions to pressure broadening and shift in speed-dependent line shape modeling, i.e. whether the lineshape parameters follow partial pressure weighting in the binary mixtures. P(11) is relatively isolated with respect to underlying hot band transitions and neighboring transitions of the same band, but it was found that the accurate positions of underlying hot band transitions were crucial to the successful modeling of the observed line shapes, even though these lines are typically 100-1000 times weaker than P(11) itself and are many Doppler line widths removed from the line center. Positions of the hot band lines quoted in the HITRAN database, which are derived from the analysis of high resolution FTIR spectra, are of the order of 10’s of MHz in error. In parallel work, we have measured the positions of many of these lines by saturation dip spectroscopy. Progress in the analysis of the data and the new saturation dip line center measurements will be reported.

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