FREQUENCY COMB-REFERENCED MEASUREMENTS OF SELF- AND NITROGEN-PERTURBED LINE SHAPE PARAMETERS IN THE ν_1 + ν_3 BAND OF ACETYLENE

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Using an extended cavity diode laser locked to a single component of an Er-fiber-based femtosecond frequency comb, we have made precise measurements of absorption spectral line shapes in a temperature controlled cell. Varying pressures of acetylene and nitrogen were used to determine the N_2 pressure-dependent parameters for the P(11) line in the ν_1 + ν_3 combination band of acetylene at 195 739.649 513(8) GHz. The temperature dependence of the line shape was determined from measurements at several temperatures, varying from 296 K to 125 K. With the absolute frequency positions at each point on the frequency scale determined by the comb, each experimental data set has better than 10^{-4} fractional error. Parameters describing the line shape, such as pressure-dependent broadening, narrowing and shift coefficients, can be obtained with standard deviations less that 0.1%. The data have been used to test various line shape models beyond the standard Voigt approximation including those with narrowing parameters (Rautian and Galatry models) and those with speed-dependence (Speed-dependent Voigt and Speed-dependent Nelkin-Ghatak models). Fitting results will be presented and the relative performance of the models will be discussed.

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