NITROGEN- AND SELF-BROADENING AND SHIFT COEFFICIENTS IN THE ν_3 FUNDAMENTAL BAND OF $^{12}CH_3D$

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A multispectrum nonlinear least-squares fitting technique[a] has been used to determine Lorentz broadening and pressure-induced shift coefficients for a large number of transitions in the ν_3 fundamental band of $^{12}CH_3D$ in the region from 1150 to 1430 cm^{-1}. We analyzed a total of 14 high-resolution (0.006 cm^{-1}) room temperature absorption spectra recorded with the 1-m Fourier transform spectrometer (FTS) at the McMath-Pierce facility of the National Solar Observatory at Kitt Peak. The data set included 10 spectra of 98% pure CH_3D and 4 spectra of CH_3D in N_2. Our multispectrum analysis technique allowed us to simultaneously analyze both self-broadened and N_2-broadened spectra.

The measurements in the ν_3 band included transitions with rotational quantum numbers as high as $J'' = 16$ and $K'' = 16$. We determined N_2-broadening and shift coefficients for about 300 transitions and self-broadening and shift coefficients for over 400 transitions. The broadening coefficients (both self and N_2) range between 0.02 and 0.10 cm^{-1} atm^{-1} at 296K. Both the self-shift and the N_2-shift coefficients vary between about -0.012 and +0.009 cm^{-1} atm^{-1}. At least 95% of the measured shift coefficients are negative, and the small number of positive shift coefficients often involve transitions with $J'' = K''$. The $J'' = K''$ transitions in the ^QQ sub-band show the smallest broadening coefficients. The present results will be compared to previous measurements in this parallel band and in the nearby perpendicular ν_5 and ν_6 bands.

[a] D. Chris Benner, C. P. Rinsland, V. Malathy Devi, M. A. H. Smith, and D. Atkins, *JQSRT* **53**, 705-721 (1995).