

BROADENING AND SHIFT COEFFICIENTS IN THE 3- μ m BANDS OF HCN

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While there have been a number of recent studies of room-temperature N₂-broadening of spectral lines in various molecular bands of HCN, the corresponding pressure-induced line shifts have not been measured. Only three limited studies of the temperature-dependence of N₂-broadening in HCN have been reported, and air- and O₂-broadening have been examined only at room temperature for single HC¹⁵N rotational line.^a We have recorded over 80 new infrared spectra of HCN broadened by N₂, O₂, or air at room temperature and low temperatures using a 50-cm coolable cell with the McMath-Pierce Fourier transform spectrometer (FTS) of the National Solar Observatory on Kitt Peak, Arizona. Most of these spectra cover bandpasses of either 2750-3950 cm⁻¹ at 0.008 cm⁻¹ resolution or 600-3000 cm⁻¹ at 0.005 cm⁻¹ resolution. Volume mixing ratios of HCN in the broadening gases were 0.1% or less, and total sample pressures ranged from 12 Torr to over 500 Torr. Most spectra were recorded at temperatures from room temperature down to near the freezing point of HCN (-13°C), and some spectra were successfully recorded at temperatures down to about -60°C. Several spectra of low pressures (about 0.1 Torr) of purified HCN were also recorded to provide line positions unaffected by pressure-induced shifts. An initial group of 19 of these absorption spectra have been analyzed simultaneously using our multispectrum nonlinear least-squares technique^b to determine N₂-broadening and shift coefficients and their temperature dependences for transitions up to $J'' = 30$ in the ν_1 fundamental band of H¹²C¹⁴N. The results for N₂-broadening compare well with available values reported in the literature. In particular, the N₂-broadening temperature-dependence exponent n shows a quantum-number dependence similar to that observed in the ν_2 band by Schmidt et al.^c Analysis of air-broadening and shifts in the ν_1 band is in progress, as well as work on the ν_2 and $2\nu_2$ band systems.

^aJ.-M. Colmont, *J. Mol. Spectrosc.* **114**, 298-304 (1985).

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

^cC. Schmidt, J.-C. Populaire, J. Walrand, G. Blanquet and J.-P. Bouanich, *J. Mol. Spectrosc.* **158**, 423-432 (1993).