AIR- AND N_2 - BROADENING COEFFICIENTS AND PRESSURE SHIFT COEFFICIENTS IN THE $^{12}C^{16}O_2$ LASER BANDS

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This study reports both the pressure broadening and the pressure-induced shift coefficients for 46 rovibrational lines with J values ranging from P(46) to R(44) in the $^{12}C^{16}O_2$ 00^01-$(10^00$-$02^00)_I$ and 00^01-$(10^00$-$02^00)_{II}$ laser bands (Laser band I centered at 960.959 cm^{-1} and Laser band II centered at 1063.735 cm^{-1}). The measurements used spectra recorded with the McMath-Pierce Fourier Transform spectrometer. The results were obtained from analysis of 10 long path laboratory absorption spectra recorded at room temperature and at 0.0027 cm^{-1} resolution using a multispectrum nonlinear least-squares technique.[a] Pressure effects caused by both air and nitrogen were investigated. The air broadening coefficients determined in this study agreed well with the values in the recent HITRAN compilation.[b] Broadening by nitrogen was 3 to 4% larger than that of air. The individual shift coefficients were all negative or within two standard deviations of zero. The mean value for each broadening gas for each band was about -1.5×10^{-3} cm^{-1} atm^{-1} at 296 K with a typical scatter among the shift coefficients of the various rotational quantum numbers of about 8×10^{-4} cm^{-1} atm^{-1} at 296 K. Similar to broadening coefficients, the pressure-induced line shift coefficients were also found to be transition dependent, but were different for the P- and R-branch lines with the same J value. No significant differences in the shift coefficients caused by air and nitrogen were found. The results obtained were compared with values reported in the literature.

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

[b] L. S. Rothman, R. R. Gamache, R. H. Tipping, C. P. Rinsland, M. A. H. Smith, D. C. Benner, V. Malathy Devi, J.-M. Flaud, C. Camy-Peyret, A. Perrin, A. Goldman, S. T. Massie, L. R. Brown, and R. A. Toth, *JQSRT* **48**, 469-507 (1992); L. S. Rothman *et al.*, in preparation, (1997).