SELF- AND H_2-BROADENING AND SHIFT COEFFICIENTS IN THE 2-0 BAND OF $^{12}C^{16}O$

M. A. H. SMITH, C. P. RINSLAND, *Atmospheric Sciences, NASA Langley Research Center, Mail Stop 401A, Hampton, VA 23681-2199*; A. W. MANTZ, *Department of Physics, Astronomy and Geophysics, Connecticut College, New London, CT 06320*; D. CHRIS BENNER and V. MALATHY DEVI, *Department of Physics, The College of William and Mary, Box 8795, Williamsburg, VA 23187-8795*.

Self- and hydrogen-broadening and pressure-shift coefficients for the first overtone band transitions of $^{12}C^{16}O$ at room temperature have been determined through analysis of nine high-resolution (0.005 cm^{-1}) absorption spectra. These spectra were recorded using the 1-m Fourier transform spectrometer (FTS) at the McMath-Pierce facility of the National Solar Observatory on Kitt Peak, Arizona. Eight of the nine spectra (including the three H_2-broadened spectra) were recorded using a high-purity CO sample having natural isotopic composition, and a single self-broadened spectrum was obtained using a CO sample having 99.999 atom % ^{12}C. A Pyrex cell with 10 cm path length was used to record all of the spectra. Self-broadened sample pressures ranged from about 3 to 507 Torr, and the H_2-broadened spectra had total pressures of 155 to 475 Torr. Because of the short path length of the cell, the volume mixing ratios of CO in H_2 were relatively high, approximately 18% to 22%, to achieve measurable absorption in the 2-0 band. These mixing ratios necessitated the simultaneous determination of the CO self-broadening and self-shift coefficients along with the H_2-broadening and H_2-induced shift coefficients. We have determined these coefficients at room temperature, along with line positions and intensities, for the P(26) through R(22) $^{12}C^{16}O$ 2-0 transitions by fitting the entire spectral interval from 4130 to 4360 cm^{-1} in all nine spectra simultaneously. Our multispectrum nonlinear least-squares procedure[a] was used to retrieve these spectral line parameters. The results will be compared to previous published values where possible.

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