SELF- AND AIR-BROADENING OF $^{12}C^{16}O$, $^{13}C^{16}O$ AND $^{12}C^{18}O$ AT 2.3 μm

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High resolution (0.005 cm^{-1}) absorption spectra of CO and two of its isotopologues (^{13}CO and $C^{18}O$) were recorded between 3550 and 5250 cm^{-1} using the Bruker IFS-125HR Fourier transform spectrometer (FTS) located at the Jet Propulsion Laboratory (JPL) and a specially designed and built coolable 20.38 cm long absorption cell[a] placed within the sample compartment of the FTS. More than 50 spectra of both pure and air-broadened samples of CO, ^{13}CO and $C^{18}O$ were recorded at various temperatures from 150 K to 298 K, with maximum total pressures up to $\sim$700 Torr. A multispectrum nonlinear least squares spectrum fitting technique[b] was used to determine the spectral line shape parameters including speed dependence, Lorentz halfwidth coefficients, pressure-induced shift coefficients, and off-diagonal relaxation matrix element coefficients for line mixing. These line shape parameters were obtained for both self- and air-broadening, and temperature dependences of these parameters were determined where possible. As previously done in studies of CO_2,[c] rather than retrieving individual line positions and intensities, we constrained them to their theoretical relationships, including Herman-Wallis terms, determining only the band intensities and rovibrational constants. The results are discussed and compared with values reported in the literature.[d]

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[a] K. Sung, A. W. Mantz, M. A. H. Smith, L. R. Brown, T. J. Crawford, V. Malathy Devi and D. C. Benner, *JMS* **262** (2010) 122-134.

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

[c] V. Malathy Devi, D. C. Benner, L. R. Brown, C. E. Miller and R. A. Toth, *JMS* **242** (2007) 90-117.

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