

NEAR INFRARED SPECTROSCOPY OF CARBON DIOXIDE: $^{16}\text{O}^{12}\text{C}^{16}\text{O}$ LINE POSITIONS

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High-resolution near infrared 4000 - 9000 cm^{-1} spectra of carbon dioxide have been recorded using the McMath-Pierce Fourier transform spectrometer at the Kitt Peak National Solar Observatory. Spectroscopic constants have been determined for 53 different vibrational states of the $^{16}\text{O}^{12}\text{C}^{16}\text{O}$ isotopologue, including 8 vibrational states for which laboratory spectra have not previously been reported. Calibration using the 2-0 band of CO near 4200 cm^{-1} and the $(\nu_1 + \nu_3)$ combination band of C_2H_2 near 6500 cm^{-1} provides absolute line position accuracies of $2 \times 10^{-5} \text{ cm}^{-1}$ (RMS) for strong, isolated transitions throughout the observed range. Fits with RMS errors less than $3.8 \times 10^{-5} \text{ cm}^{-1}$ have been obtained for the 20013 \leftarrow 00001, 20012 \leftarrow 00001, and 20011 \leftarrow 00001 bands and RMS errors less than $6 \times 10^{-5} \text{ cm}^{-1}$ have been obtained for the 30014 \leftarrow 00001, 30013 \leftarrow 00001, 30012 \leftarrow 00001, and 00031 \leftarrow 00001 bands. The new line list satisfies the line position accuracies required for the next generation of CO_2 remote sensing instruments, improves the capability of solar-viewing spectrometers to retrieve precise column CO_2 measurements, and provides a secondary frequency standard in the NIR.^a

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