

AIR COMPONENT FOREIGN BROADENING CONTRIBUTIONS TO CARBON DIOXIDE COLLISIONAL LINE SHAPES IN THE (30012) \leftarrow (00001) BAND

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Line-by-line spectroscopic databases of CO₂ such as those in HITRAN include so many transitions and bands that it is intractable to provide reference data for every transition and relevant collisional partner. To address this dilemma, theoretical line parameters enabling widespread coverage need to be validated in terms of accurate spectroscopic measurements having well-established uncertainties. In this work, we present frequency-agile, rapid scanning cavity ring-down spectroscopy (FARS) measurements of CO₂ (30012) \leftarrow (00001) band transitions up to J'' = 50. These data correspond to foreign broadening by four gas mixtures: air, N₂, and two Ar-enriched synthetic air samples, with each sample containing CO₂ at a mole fraction near atmospheric levels. The measured O₂, N₂, and Ar foreign broadening parameters were determined using a NIST-developed multi-spectrum fitting algorithm which used appropriate constraints for pressure, temperature, and sample composition. These experimental results are compared to theoretical semiclassical half-widths¹ as well as to literature values.

1. R. R. Gamache, J. Lamouroux, A. L. Laraia, J.-M. Hartmann and C. Boulet, *Journal of Quantitative Spectroscopy and Radiative Transfer* 113 (11), 976-990 (2012).