

COLLISION-DEPENDENT LINE AREAS IN THE $a^1\Delta_g \leftarrow X^3\Sigma_g^-$ BAND OF MOLECULAR OXYGEN

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We report precise line areas for individual rotationally resolved transitions within the $a^1\Delta_g \leftarrow X^3\Sigma_g^-$ electronic band of molecular oxygen recorded as a function of pressure for both neat samples of O_2 as well as samples of O_2 dilute with a variety of collisional partners. Using optical frequency comb referenced frequency-stabilized cavity ring-down spectroscopy (FS-CRDS) near $1.27 \mu\text{m}$ we measure line areas with a quality-of-fit $QF \leq 50,000$ using a partially correlated quadratic-speed-dependent Nelkin-Ghatak profile. This spectrometer has achieved this high QF by both suppressing coupled cavity effects and by preserving a high-fidelity frequency axis with absolute frequency accuracy approaching 1 part in 10^9 . With this instrument we are also currently exploring collision-induced absorption (CIA) and perturbative line mixing effects in O_2 over the entire $7800\text{-}7940 \text{ cm}^{-1}$ spectral range.