

A NEW COLLISION-INDUCED TRANSITION IN THE VACUUM ULTRAVIOLET SPECTRUM OF O₂

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The collision-induced photoabsorption spectrum of O₂, pressurised by He, is presented in the 1180–1340 Å-region. In addition to the collision-broadened wings of the dipole-allowed mixed Rydberg-valence transitions, we have found a series of diffuse peaks whose intensities depend linearly on the foreign-gas pressure. The observed peaks have been assigned as the (1,0)–(5,0) bands of the $\Delta\Lambda = 2$ collision-induced $3p\pi_u \ ^3\Delta_u \leftarrow X \ ^3\Sigma_g^-$ Rydberg transition, partly on the basis of comparisons with the photoabsorption spectrum of metastable O₂(¹ Δ_g).^a The relative regularity of the spacings between the observed peaks supports the conclusions of Buenker and Peyerimhoff,^b in an *ab initio* study, that there is little interaction between the $3p\pi_u \ ^3\Delta_u$ Rydberg state and the $A' \ ^3\Delta_u$ valence state, in contrast to the situation for the corresponding states of $^3\Sigma_u^-$ and $^3\Pi_u$ symmetries. Although the complexity of this spectral region and the diffuseness of the bands precludes any detailed line-profile analyses, it is clear that the integrated intensity of the $3p\pi_u \ ^3\Delta_u \leftarrow X \ ^3\Sigma_g^-$ Rydberg system exceeds that of the collision-induced $A' \ ^3\Delta_u \leftarrow X \ ^3\Sigma_g^-$ valence system^c by at least an order of magnitude. Possible sources for this intensity are discussed.

^aP. C. Hill, Ph.D. Thesis, Australian National University, (1991).

^bR. J. Buenker and S. D. Peyerimhoff, *Chem. Phys. Lett.* **34**, 225 (1975).

^cV. I. Dianov-Klokov, *Opt. Spectrosc.* **21**, 233 (1996).