

Ultraviolet Transitions in C₂

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Observations of C₂ absorption are used to probe the chemistry and physical conditions in diffuse molecular clouds. Early analyses of the $F - X$ (0-0) band seen in spectra acquired with the *Hubble Space Telescope* (*HST*) revealed anomalous line strengths. We took advantage of the large database in the *HST* archive to study C₂ in the most comprehensive UV survey to date. Spectra of the $D - X$ (0-0), $F - X$ (0-0), and $F - X$ (1-0) bands were analyzed. The $D - X$ (0-0) band, whose oscillator strength is well known from laboratory measurements and theoretical calculations, yielded C₂ column densities for several directions. The abundances were used to synthesize the $F - X$ bands as a check on the appropriate oscillator strengths for use with these Rydberg bands and on the presence of line anomalies. While the oscillator strengths are consistent with earlier determinations, we found all the $F - X$ lines to be broadened and the $F - X$ (0-0) lines for $J < 20$ to show anomalies in line strength. Shifts from the expected line positions were also seen, with the largest shifts arising for J about 10. Perturbations from nearby electronic states are the likely cause for this behavior. The number of sight lines with C₂ column densities was extended through analysis of data on the $F - X$ (1-0) band.

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