THE '4050 Å GROUP' OF THE $\tilde{A}^1\Pi_u$ - $\tilde{X}^1\Sigma_g^+$ TRANSITION SYSTEM OF C_3

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The '4050 Å group' of C_3, which consists of a series of bands of the $\tilde{A}^1\Pi_u$ - $\tilde{X}^1\Sigma_g^+$ electronic transition system, has been of much interest to astronomers as it serves as a remote diagnostic of the physical-chemical conditions in translucent interstellar clouds. In this contribution, we present:

a) The high resolution ($R = 80\ 000$) detection of eight vibronic bands of C_3 in the diffuse translucent cloud towards HD 169454. Four of these vibronic bands are also detected in two additional objects: HD 73882 and HD 154368. Column densities and excitation conditions of C_3 are inferred.

b) A laboratory re-examination of the eight vibronic bands observed towards HD 169454 using cavity ring-down spectroscopy and a supersonic plasma jet. High-quality laboratory data build the list of lines with a wavelength accuracy of <0.01Å. This is sufficient for the analysis of the observational data. Improved spectroscopic parameters of the corresponding vibronic states are presented. An improved perturbation analysis in the $\tilde{A}^1\Pi_u$ (000) state is given as well.

c) The systematic laboratory investigation on the $\tilde{A}^1\Pi_u$ - $\tilde{X}^1\Sigma_g^+$ 000-000 electronic origin band of ^{13}C-substituted C_3. Rotationally resolved spectra of all five ^{13}C-isotopologues are recorded in a supersonic plasma expansion by discharging $^{13}C_2H_2$ or $^{12}C_2H_2$/$^{13}C_2H_2$ mixtures diluted in noble gas. The $\tilde{A}^1\Pi_u$ state molecular constants for all five isotopologues and ground-state molecular constants for $^{13}C^{12}C^{13}C$ and $^{12}C^{13}C^{13}C$ are experimentally determined for the first time. This work extends the recent mid-infrared work on the ^{13}C-isotopologues of C_3 by Giesen *et al.*[a]

[a] T. Giesen, private communication, December 2012.