NEW ASSIGNMENTS IN THE $\tilde{A}^1\Pi_u - \tilde{X}^1\Sigma_g^+$ (405 nm) TRANSITION OF C_3

GUIQIU ZHANG, KAN-SEN CHEN, WEI-JAN CHEN, SHAJI SADISAVAN, YEAN-AN LIAO, NARAYANAN KUTHRUMMAL, GAEL ROUILLE, YEN-CHU HSU, *Institute of Atomic and Molecular Sciences, Academia Sinica, P.O.Box 23-166, Taipei, Taiwan*; ANTHONY J. MERER, *Department of Chemistry, University of British Columbia, 2036 Main Mall, Vancouver B.C. V6T 1Z1, Canada*.

High resolution laser-induced fluorescence spectra of supersonic jet-cooled C_3 have addressed various questions about the $\tilde{A}^1\Pi_u$ state. When the time gating of the fluorescence detection is set to 800-2300 ns after the preparation of the C_3 molecules, a number of extra lines representing states perturbing the 000 level are observed. Some of these have been observed previously by McCall et al.[a] and Tanabashi et al.[b]. Our rotational analysis shows that there are two long-lived perturbing states, which appear to be the F_1 spin component of a $^3\Sigma_u^-$ state and a P = 1 state with low B value. Lifetimes have been measured for some of the perturbing rotational levels. Rotational analyses have also been carried out for the 12^-1 - 101 $(\Pi_g - \Sigma_u^+)$ and 011 - 011 $(\Delta_u - \Pi_g)$ "hot" bands, which lie nearby. At higher energy, the vibrational assignments of the $\tilde{A} - \tilde{X}$ system given by Smith et al.[c] have been extended to 29500 cm^{-1}. The pure bending progressions can be followed to 0 22^- 0 for the lower Born-Oppenheimer component and 0 12^+ 0 for the upper component; the vibrational assignments are secure because the degradation of the rotational structure is very characteristic. Assignments have also been made for the 0v2 and 1v2 upper state bending progressions. Two further members of the vibronically-induced $\Sigma_u^+ - \Sigma_g^+$ component of the $\tilde{A} - \tilde{X}$ system, reported by Izuha and Yamanouchi,[d] have been assigned; these have upper states 13^+1 and 15^+1.

[a] B.J. McCall, R. N. Casaes, M. Ádámkovics and R. J. Saykally, Chem. Phys. Lett. 374, 583 (2003).
[b] A. Tanabashi, T. Hirao, T. Amano and P. F. Bernath, Ap. J., accepted for publication (2005).
[c] R. S. Smith, M. Anselment, L. F. DiMauro, J. M. Frye and T. J. Sears, J. Chem. Phys. 89, 2591 (1988).
[d] M. Izuha and K. Yamanouchi, J. Chem. Phys. 109, 1810 (1998).