LASER INDUCED FLUORESCENCE SPECTROSCOPY OF A LINEAR CARBON CHAIN MOLECULE, C_3N

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Laser induced fluorescence spectra of a linear carbon chain molecule, C_3N, were observed in a near UV region for the first time. The radical was produced in a supersonic jet by discharging HC_3N diluted in Ar using a pulsed-discharge-nozzle. A Nd:YAG laser excited dye laser with a 0.03 cm^{-1} linewidth was used as an excitation source. A number of vibronic bands with clearly resolved rotational structures were observed. The observed bands were classified into three categories: $\Pi - \Sigma$ bands, $\Sigma - \Sigma$ bands with no spin splittings, and $\Sigma - \Sigma$ bands with large spin splittings. These spectral features were quite similar to those of C_4H reported previously[a].
The observed electronic transition was thus assigned as $B^2\Pi - X^2\Sigma$ subjected to a Renner-Teller interaction. The symmetry forbidden $\Sigma - \Sigma$ type bands were observed by a strong vibronic mixing in the ground state with a low lying $A^2\Pi$ state. Time profiles of the fluorescence decay signals showed quantum beats due to local vibronic mixings in the upper state. Dispersed fluorescence spectra from various vibronic bands were observed to locate the low lying $A^2\Pi$ state.

[a] K Hoshina, H. Kohguchi, Y. Endo, and Y. Ohshima, 51st International Symposium on Molecular Spectroscopy, Paper RC13 (1996).