LIF SPECTROSCOPY OF A CARBON CHAIN RADICAL PRODUCED BY A HC_3N DISCHARGE

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New electronic transitions of a carbon chain radical containing a nitrogen atom have been observed by LIF spectroscopy. The radical was produced in a supersonic jet by a pulsed discharge of HC_3N diluted to 0.3% with 3atm Ar. We confirmed that the radical contains a nitrogen atom from the fact that the spectrum was not observed when C_2H_2 was used as a precursor.
About ten vibronic bands with a 50nsec radiative lifetime have been observed in a region from 27000 to 27400 cm^{-1}. The observed bands could be classified as $^2\Pi_{3/2}$-$^2\Pi_{3/2}$ and $^2\Sigma - ^2\Sigma$ vibronic bands. The lower state rotational constants of the vibronic bands have been determined to be 0.07537(1) and 0.07932(5) cm^{-1} for the Π and Σ states, respectively. The upper states of $^2\Sigma - ^2\Sigma$ bands have very large spin-rotation constants, which should be denoted as $\Sigma^{(\pm)}$ subjected to a small Renner-Teller interaction. The new molecule has been tentatively assigned to be the C_4N radical. We performed an UMP2 level ab initio calculation with 6-311G** basis sets for the C_4N radical. The estimated rotational constant in the ground state was 0.077 cm^{-1}. This value agrees well with the observed rotational constants.