

THE PURE MICROWAVE AND HIGH-RESOLUTION INFRARED SPECTRA OF 4-FLUOROBUT-1-YNE

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The pure rotational spectrum of the two conformers of 4-fluorobut-1-yne (*trans* and *gauche*), and the high resolution (5MHz) infrared spectrum of the acetylenic C-H stretch of the *trans* conformer have been assigned in an electric resonance optothermal spectrometer (EROS). There is no evidence of the *gauche* conformer in the vibrational spectrum. The microwave-infrared double-resonance capabilities of the EROS permit rapid and accurate assignment of the congested infrared spectrum. The high-resolution infrared spectrum indicates intramolecular energy redistribution occurs as is evidenced by the fragmentation of the rovibrational spectrum. The eigenstate resolved spectra have been recorded for $J=0-8$, $K_a 0-3$. The $K_a = 1-3$ spectra all have similar spectra with a distribution of intensity over the many lines while the $K_a = 0$ spectra appear to be resilient to IVR and are dominated by a few strong transitions. From the analysis of these spectra the average decay time of the survival probability of the acetylenic C-H stretch has been determined to be 1.4 ns. The relationship between these IVR rates and conformational isomerization will also be discussed.