

MATRIX SPECTROSCOPY OF THE PROPARGYL RADICAL AND PROPARGYL PEROXYL RADICAL

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Using a hyperthermal nozzle that we have developed we have produced propargyl radical ($\text{HC}\equiv\text{CCH}_2$) from the pyrolysis of propargyl bromide and butyn nitrite. Matrix isolated IR spectra and linear dichroism spectra were recorded, and vibrational symmetries were assigned. Photoionization mass spectrometry also confirmed the formation of propargyl radical. This hot nozzle thermally decomposes organic precursors in a stream of Ar and produces roughly 10^{13} hydrocarbon radicals/pulse. Using time of flight mass spectrometry and matrix isolated IR spectroscopy we have also observed the bimolecular self reaction of propargyl to form benzene, $\text{C}_3\text{H}_3 + \text{C}_3\text{H}_3 \rightarrow \text{C}_6\text{H}_6$. IR spectra also show that the formation of $\text{CH}_3\text{-C}\equiv\text{CH}$ and $\text{CH}_2=\text{C}=\text{CH}_2$ occurs in the hyperthermal nozzle. Co-depositing the propargyl radical with molecular oxygen allows us to synthesize the propargyl peroxy radical ($\text{H-C}\equiv\text{C-CH}_2\text{OO}$), which we have characterized in the infrared as well.