INFRARED SPECTROSCOPY OF THE MASS 31 CATION: PROTONATED FORMALDEHYDE VS. THE TRIPLET METHOXY CATION

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The m/z=31 cation is produced by ionization and fragmentation of methanol, ethanol, dimethyl ether, etc. Two structures have been proposed, protonated formaldehyde ($^1CH_2OH^+$) and the triplet methoxy cation ($^3CH_3O^+$). The infrared spectrum of the mass 31 cation is obtained using infrared photodissociation spectroscopy with Ar tagging. The spectrum reveals the presence of two stable isomers, protonated formaldehyde ($^1CH_2OH^+$) and the triplet methoxy cation ($^3CH_3O^+$). The triplet methoxy cation has been studied extensively and is predicted to interconvert to protonated formaldehyde through an essentially barrierless process on a timescale much faster than our experiment (> 100 μs). The presence of two structural isomers is verified by comparison of spectra from different precursors and spectra of different temperature ions from the same precursor.