HIGH RESOLUTION INFRARED SPECTRA OF 2-METHYL-1-BUTEN-3-YNE

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The high resolution infrared spectrum (5MHz) of the acetylenic C-H stretch of 2-methyl-1-buten-3-yne ($HCCC(CH_3)=CH_2$) has been assigned using microwave-infrared double-resonance spectroscopy. The double-resonance capabilities of our electric-resonance optothermal spectrometer allow for unambiguous rotational assignment of the extremely dense rovibrational spectrum. The high-resolution infrared spectrum shows substantial fragmentation and is evidence of extensive intramolecular vibrational energy redistribution (IVR). The local perturbations split the transition moment into a set of transitions containing as many as 100 or more components. Due to the rapid increase in state density as J increases only J=0-3 Ka=0-2 transitions have been assigned. From the analysis of these spectra the survival probability of the acetylenic C-H stretch has been determined to be 95 ps. Initial spectra of the ethylenic ($C=CH_2$) hydrogens indicate a substantially longer IVR lifetime than for the acetylenic hydrogen. Preliminary work on the rotational spectra of vibrationaly-excited 2-methyl-1-buten-3-yne will also be presented.