INFRARED VACUUM ULTRAVIOLET SPECTROSCOPY OF ALLYL RADICAL

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An infrared (IR)-vacuum ultraviolet (VUV) double resonance experiment on the allyl (CH_2CHCH_2) radical will be described. The pulsed field ionization-photoelectron (PFI-PE) spectrum of the allyl (CH_2CHCH_2) radical has already been obtained and used to determine the accurate ionization energy of 65 584.6 +/- 2.0 cm^{-1} (8.131 46 0.000 25 eV). Next, building on previous work which identified IR resonances at 3113.98 and 3110.59 cm^{-1}, we anticipate the first IR-VUV double resonance spectrum of the allyl (CH_2CHCH_2) radical.

We have shown previously that high-resolution IR spectra of polyatomic neutral closed shell molecules can be obtained with high sensitivity by scanning the frequency of a single mode infrared optical parametric oscillator (IR-OPO) laser to excite the molecular species of interest and fixing the frequency of a tunable vacuum ultraviolet (VUV) laser to photoionize the IR excited species. The fact that this IR-VUV method is based on a VUV photoionization probe together with time of flight (TOF) mass spectrometry (MS) detection allows the identification of the neutral IR absorber, making the method applicable for IR spectroscopy measurements of radicals, isotopomers, and clusters, which normally exist as impure samples.