VIBRATIONAL SPECTRUM OF THE THIOMETHOXY (CH_3S) RADICAL INVESTIGATED WITH INFRARED-VACUUM ULTRAVIOLET PHOTOIONIZATION

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We produced methylthio (or thiomethoxy, CH_3S) radicals by photodissociation of CH_3SH in a supersonic jet at 248 nm. The CH_3S^+ ions were subsequently produced with the 1+1 IR-VUV photoionization and detected with the time-of-flight (TOF) technique. The IR spectrum of CH_3S was obtained on tuning the wavelength of the IR laser in the range 2780–3280 cm^{-1} while monitoring the intensity of the CH_3S^+ signal; the frequency of the VUV laser was maintained at 134.8 nm, 200 cm^{-1} below the ionization threshold of CH_3S (IE = 9.225 eV). This technique has an advantage over other IR-absorption techniques because its mass selectivity eliminates interferences from the precursor and other photolysis products such as H_2CS, CH_3, or CH_3SS. Absorption bands near 2820, 2904, and 3215 cm^{-1} were observed and tentatively assigned as transitions from the ground vibrational state to the 1^1, 4^1 (a_1), and $5^1 6^2$ states, respectively. These bands are in agreement with those reported for CH_3S produced via in situ photolysis of CH_3SH, CH_3SCH_3, and CH_3SSCH_3 isolated in solid p-H_2.[1] A new band near 2970 cm^{-1} that is consistent with that observed in photoelectron spectrum[2] might be assigned to the transition from the ground vibrational state to the a_1 component of the $5^1 6^2$ state.

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[a] M. Bahou and Y.-P. Lee, *J. Chem. Phys.* **133**, 164316 (2010).

[b] R. L. Schwartz, G. E. Davico, and W. C. Lineberger, *J. electron Spectrosc. Relat. Phenom.* **108**, 163 (2000).