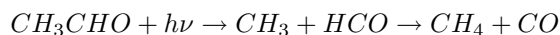


CONTINUOUS MONITORING OF PHOTOLYSIS PRODUCTS BY THZ SPECTROSCOPY

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We demonstrate the potential of THz spectroscopy to monitor the real time evolution of the gas phase concentration of photolysis products and determine the kinetic reaction rate constant^a. In the primary work, we have chosen to examine the photolysis of formaldehyde (H₂CO)^b. Exposure of H₂CO to a UVB light (250 to 360 nm) in a single pass of 135 cm length cell leads to decomposition via two mechanisms: the radical channel with production of HCO and the molecular channel with production of CO. A commercial THz source^c (frequency multiplication chain) operating in the range 600-900 GHz was used to detect and quantify the various chemical species as a function of time. Monitoring the concentrations of CO and H₂CO via rotational transitions, allowed the kinetic rate of H₂CO consumption to be obtained, and an estimation of the rate constants for both the molecular and radical photolysis mechanisms.

We have modified our experimental setup to increase the sensitivity of the spectrometer and changed sample preparation protocol specifically to quantify the HCO concentration. Acetaldehyde was used as the precursor for photolysis by UVC resulting in the decomposition mechanism can be described by:



Frequency modulation of the source and Zeeman modulation is used to achieve the high sensitivity required. Particular attention has been paid to the mercury photosensitization effect that allowed us to increase the HCO production enabling quantification of the monitored radical. We quantify the HCO radical and start a spectroscopic study of the line positions.

^aH. M. Pickett and T. L. Boyd, Chem. Phys. Lett, Vol 58, 446-449, (1978)

^bS. Eliet, A. Cuisset, M Guinet, F. Hindle, G. Mouret, R. Bocquet, and J. Demaison, Journal of Molecular Spectroscopy, Vol 279, 12-15 (2012).

^cG. Mouret, M. Guinet, A. Cuisset, L. Croizé, S. Eliet, R. Bocquet and F. Hindle, Sensors Journal. IEEE, Vol 13, 133 – 138, (2013)