FOURIER TRANSFORM MICROWAVE SPECTROSCOPIC STUDIES OF DIMETHYL ETHER AND ETHYLENE FLAMES

DANIEL A. OBENCHAIN, *Institut für Physikalische Chemie und Elektrochemie, Gottfried-Wilhelm-Leibniz-Universität, Hannover, Germany*; JULIA WULLENKORD, KATHARINA KOHSE-HÖINGHAUS, *Physikalische Chemie I, University of Bielefeld, Bielefeld, Germany*; JENS-UWE GRABOW, *Institut für Physikalische Chemie und Elektrochemie, Gottfried-Wilhelm-Leibniz-Universität, Hannover, Germany*; NILS HANSEN, *Combustion Research Facility, Sandia National Laboratories, Livermore, CA, USA*.

Microwave spectroscopy has been a proven technique for the detection of short-lived molecules produced from a variety of molecular sources. With the goal of observing more reactive intermediates produced in combustion reactions, the products of a home-built flat flame burner were measured on a coaxially oriented beam resonator arrangement (COBRA) Fourier transform microwave spectrometer.[a] The products are coupled into a molecular beam using a fast-mixing nozzle styled after the work of Gutowsky and co-workers.[b]

Probing the flame at various positions, the relative abundance of products can be observed as a function of flame depth. One dimensional intensity profiles are available for formaldehyde, ketene, acetaldehyde, and dimethyl ether, where either a dimethyl ether fuel or an ethylene fuel was burned in the presence of oxygen. The current arrangement allows only for stable species produced in the flame to be observed in the molecular beam. This combination of species source and detection shows promise for future work in observing new, short-lived, combustion intermediates.

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[a] J.-U. Grabow, W. Stahl, H. Dreizler, Rev. Sci. Instrum. 67, 4072, 1996

[b] T. Emilsson, T. D. Klots, R. S. Ruoff, H.S. Gutowsky, J. Chem. Phys. 93, 6971, 1990