DEMONSTRATION OF CRESU-REMPI FOR REACTION KINETIC MEASUREMENTS IN THE GAS-PHASE

RANIL GURUSINGHE, NURESHAN DIAS, JINXIN LANG, *Department of Chemistry, University of Missouri, Columbia, MO, USA*; MATTHEW L EDLIN, *Chemistry, University of Missouri, Columbia, MO, USA*; ARTHUR SUITS, *Department of Chemistry, University of Missouri, Columbia, MO, USA*.

The CRESU technique (French acronym for "reaction kinetics in uniform supersonic flows") provides a wall-less gas-phase reactor to measure low-temperature reaction kinetics. In the past, probing methods such as laser-induced fluorescence (LIF), mass spectrometry, and chirped-pulse uniform flow (CPUF) microwave spectroscopy have been successfully used to measures reaction kinetics in CRESU flows, but the latter two call for sampling of the flow prior to detection. Here we show a selective, low-cost, and highly sensitive probing tool to measure the kinetics of reactions that involve both molecular and atomic species. This new detection method uses resonance-enhance multi-photon ionization (REMPI) and an electron capture probe, adapted from approaches successfully used in flames, to selectively identify atomic and molecular species. A negative-biased high voltage applied to two electrodes, that are placed on either side of a grounded probe, enables rapid capture of electrons produced by the selective ionization from the REMPI spectroscopy. The performance of this setup was verified by recording the (1+1) REMPI spectra of nitric oxide in 20 K and 50 K uniform supersonic flows. The REMPI probe response is proportional to the number of electrons produced by ionization, and therefore to the concentration of ionized species. Thus, the time-dependent REMPI signal can be used to measure the rate of decay or growth of a reactant or product in fast chemical reactions in CRESU flows.