CRESU-REMPI- A TOOL TO CHARACTERIZE EXTENDED QUASI-UNIFORM FLOW

SHAMEEMAH THAWOOS, *Department of Chemistry, University of Missouri, Columbia, MO, USA*; NICOLAS SUAS-DAVID, *IPR UMR6251, CNRS - Université Rennes 1, Rennes, France*; MATTHEW L EDLIN, *Chemistry, University of Missouri, Columbia, MO, USA*; ARTHUR SUITS, *Department of Chemistry, University of Missouri, Columbia, MO, USA*.

CRESU is a French acronym for *reaction kinetics in uniform supersonic flow*. Since the inception of this method the overwhelming studies have been carried out using laser induced fluorescence detection. In our group we have taken up diversifying the method of detections used to probe uniform supersonic flows to study reaction kinetics at very low temperatures. One such method involves coupling Chirped-Pulse Fourier-Transform mmWave spectroscopy with the flow, "CPUF" (chirped-pulse uniform flow). However, sampling and detection using the CPUF method has its own limitations as the high-density flow and the collisional environment can interfere with the free induction decay and attenuate the signal. To prevent this and maximize the capabilities of CPUF method we have developed an extended quasi-uniform flow design. The approach involves using an extended nozzle such that the reaction of interest takes place *within the nozzle itself* where the flow is considered to be uniform. Then, at the nozzle exit, the flow undergoes a second expansion to lower density and temperature which is ideal for the CPUF detection. To implement this, we need to monitor the conditions within the nozzle, and commonly used impact pressure measurements are not feasible inside the nozzle. We have instead implemented a REMPI (resonance-enhanced multiphoton ionization) detection scheme which allows characterization of the conditions of the flow inside the extended nozzle. We have built and characterized an extended nozzle with a series of electrodes to capture the electron signals produced in the REMPI detection step. We have characterized this 22 K He uniform flow using (1+1) REMPI of NO. Ongoing studies with this extended flow setup involve investigation of low temperature reaction kinetics of HCO with NO and O_2.