Announcing the Final Examination of Andrew Laich for the degree of Master of Science

Time & Location: March 30, 2020 at 2:00 PM in Engineering 2 202
Title: A shock tube chemical kinetic study of ethanol oxidation at elevated pressures

Understanding the combustion chemistry of ethanol is critical for continued proliferation and use in future internal combustion engines (ICEs) that will operate in a downsized, turbo-charged, high compression configuration. Detailed chemical kinetic reaction mechanisms already exist for ethanol, which have been validated over a range of operating conditions; however, capturing the conditions that may be seen in future ICEs requires extension of these conditions, namely at elevated pressure. Investigating the kinetics of ethanol existing in a combustion system first involve, for example, understanding a key global metric like ignition delay time (IDT) and measuring major or minor species in a time resolved fashion capturing both formation and decomposition stages. A shock tube facility offers ideal (thermodynamically) operation that can be used to study the high pressure kinetics across a wide range of temperatures, all the while enabling non-intrusive temporal in situ measurements within the given test time.

Oxidation of ethanol was carried out behind reflected shock waves at elevated pressures by measuring IDTs and carbon monoxide (CO) time-histories, the latter of which utilized a distributed feedback quantum cascade laser centered at a wavelength in the infrared (IR). With the gathered data, various ignition regimes and sensitive chemistry were investigated for high pressure CO formation. Since CO is an important product of combustion, having an accurate prediction of its formation is necessary to preliminarily understand the efficiency and sustainability of future engine designs. Moving forward, hazardous products like CO among other harmful emissions will have more strict governmental constrains, which further supports studies as these that aid in the continued refinement of such chemical kinetic mechanisms.

Major: Mechanical Engineering

Educational Career:
Bachelor's of Mechanical Engineering, BS, 2017, University of Michigan - Dearborn

Committee in Charge:
Subith Vasu, Chair, MAE
Louis Chow, UCF MAE
Jayanta Kapat, UCF MAE

Approved for distribution by Subith Vasu, Committee Chair, on March 30, 2020.

The public is welcome to attend.