Time & Location: October 31, 2017 at 5:00 PM in Building 154 102
Title: SIMULTANEOUS IMAGING OF THE DIATOMIC CARBON AND METHYLIDYNE SPECIES RADICALS FOR THE QUANTIFICATION OF THE FUEL TO AIR RATIO FROM LOW TO HIGH PRESSURE COMBUSTION

The radical intensity ratio of the diatomic carbon to methylidyne was characterized at initial pressures up to 10 bar using certified gasoline of 93% octane. This gasoline was selected due to its availability as a common fuel. The characterization of the radical intensity ratio of gasoline at elevated pressures enabled the creation of a calibration map of the equivalence ratio at engine relevant conditions.

The proposed calibration map acts as a feedback loop for a combustor. It allows for the location of local rich and lean zones. The local information acquired can be used as an optimization parameter for injection and ignition timings, and future combustor designs. The calibration map is applicable at low and high engine loads to characterize a combustors behavior at all points in its operation map.

Very little emphasis has been placed on the radical intensity ratio of unsteady flames, flames at high pressure, and liquid fuels. The current work performed the measurement on an unsteady flame ignited at different initial pressures employing a constant volume combustion chamber and liquid gasoline as the fuel source. The chamber can sustain a pressure rise of 200 bar and allows for homogenous fuel to air mixtures.

The results produced a viable calibration map from 1 to 10 bar. The intensity ratio at initial pressures above 5 bar behaved adversely in comparison to the lower pressure tests. The acquired ratios at the higher initial pressures are viable as individual calibration curves, but created an unexpected calibration map. The data shows promise in creating a calibration map that is useful for practical combustors.

Major: Aerospace Engineering

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Approved for distribution by Kareem Ahmed, Committee Chair, on October 3, 2017.

The public is welcome to attend.