Experimental facility for measurement of laminar burning velocities of multicomponent gaseous fuel mixtures at high temperatures

The cleaner and higher efficiency burning of syngas mixtures in integrated gasification combined cycle (IGCC) have made syngas the most promising alternative to conventional fossil fuels for power generation. The burning velocity is an intrinsic property of a combustible mixture that characterises the overall reaction rate of the flame. We determined the laminar burning velocities of multi-component mixtures experimentally at elevated temperatures. The combustion characteristics of practical syngas mixtures is vital for efficient use of lean premixed mode of syngas-air mixtures in IGCC. The compositions selected for experiments are obtained from the gas chromatograph records provided by Cummins[®]. Preheated diverging channel technique is used for experiments.

We studied the sensitivity of various reaction pathways that contribute to the burning velocities of these mixtures. The rate of production analysis, which lets us identify the contribution of each reaction to the rate of production or destruction of a species are also carried out. Illustrations below show the stabilised flames in the diverging channel as well as the schematic of the measurement facility. We are in the developmental stages of an experimental facility which aids in the determination of burning velocities at elevated pressures and temperatures.





Stabilised flame in diverging channel

Prof. Sudarshan Kumar, Department of Aerospace Engineering, sudar@aero.iitb.ac.in