Effect of Higher Hydrocarbon, Enrichment with H$_2$, and Dilution with N$_2$/CO$_2$ on the Laminar Burning Velocity and Stability of Natural Gas – Oxidizer Mixtures

Abstract

The thesis deals with investigations on the laminar burning velocity and burned gas Markstein length of fuel mixtures predominantly containing methane, with ethane and propane as higher hydrocarbons and hydrogen as an enricher fuel, in the presence of diluents such as nitrogen (as part of air or fuel) and carbon dioxide. The influence of the higher hydrocarbons, enrichment and dilution on the LBV and $L_m$ have been systematically evaluated experimentally using the constant pressure outwardly propagating flame method, and corroborated computationally using the ANSYS Chemkin package. Reaction mechanisms have been compared for their ability to predict the LBV, and modifications to the GRI Mech 3.0 have been proposed on the basis of sensitivity analysis of the mass burning rate to elementary reactions using different popular reaction mechanisms. Results have been presented and discussed in detail.