

Investigation of Flow Behavior inside the Single Channel Catalytic Combustor for Lean Mixture

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Abstract : Catalytic combustor substantially reduces emission entailing fuel-air premixing at very low equivalence ratios. The catalytic combustion of natural gas has the potential to become sufficiently active at light off temperature by the convection of heat from the catalyst surface. Only one channel is selected to investigate both the gas and surface reactions in the catalyst bed because of the honeycomb structure of the catalytic combustor. The objective of the present study is to find the methane catalytic combustion behavior inside the catalytic combustor, where the gas phase kinetics is employed by homogeneous methane combustion and surface chemistry is described with the heterogeneous catalysis of the oxidation of methane on a platinum catalyst. The reaction of the premixed mixture in the catalytic regime improves flame stability with complete combustion for lower operating flame temperature. An overview of the flow behavior is presented inside the single channel catalytic combustor including the operation of catalytic combustion with various F/A ratios and premixed inlet temperature.

Keywords : catalytic combustor, equivalence ratios, flame temperature, heterogeneous catalysis, homogeneous combustion

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