

## Numerical Analysis of Catalytic Combustion in a Tubular Reactor with Methane and Air Mixtures over Platinum Catalyst

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**Abstract :** The presence of a catalyst inside an engine enables complete combustion at lower temperatures which promote desired chemical reactions. The objective of this work is to design and simulate a catalytic combustor by using CHEMKIN with detailed gas and surface chemistries. The simplified approach with single catalyst channel using plug flow reactor (PFR) can be used to predict reasonably well with the effect of various operating parameters such as the inlet temperature, velocity and fuel/air ratios. The numerical results are validated by comparing the surface chemistries in single channel catalytic combustor. The catalytic combustor operates at much lower temperature than the conventional combustor since lean-fuel mixture is used where the complete methane conversion is achieved. The coupling between gas and surface reactions in the catalyst bed is studied by investigating the commencement of flame ignition with respect to the surface site species.

**Keywords :** catalytic combustion, honeycomb monolith, plug flow reactor, surface reactions

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