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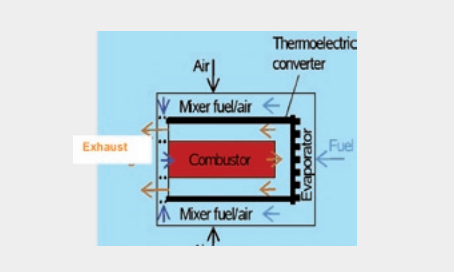
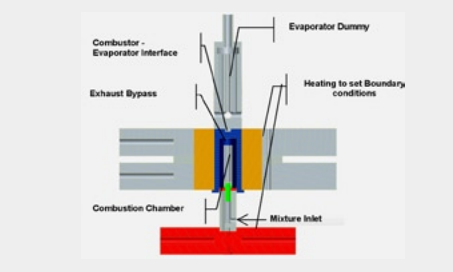
Experimental and Numerical Research of Micro Energy Converter





Setup of the experimental rig

Motivation

- New micro electro mechanical devises are asking for higher energy densities
- Today various types of secondary-batteries are predominantly in use but their limits are almost achieved.
- Hydrocarbon fuels have the potential to replace secondary-batteries due to their high energy densities
- Realisation of a Micro Energy Converter without any moving parts

Strategy of Energy Conversion

- Liquid methanol is evaporated in micro evaporator, mixed with air and than supplied to the combustion area, where the mixture is combusted.
- The hot exhaust passes first a thermoelectric generator for electrical power generation and is than bypassed to the combustion chamber wall for energy recuperation and combustion stability.
- For high thermoelectric power generation efficiencies the thermoelectric generator is located between the hot exhaust area and the cold evaporation area to realize a large ΔT.

Main Constructive Objectives

Numerical Approach
- Thermodynamic optimisation of the system
- Numerical investigation of homogenous and heterogeneous combustion
- For high thermoelectric power generation efficiencies the thermoelectric generator is located between the hot exhaust area and the cold evaporation area to realize a large ΔT.

Experimental Approach
Realisation of a variable experimental rig to investigate the influence of a:
- Variation of boundary conditions
- Variation of constructive elements
- Variation of converter size

Global objectives

Describing and understanding of flow and combustion near wall phenomena in micro devices.