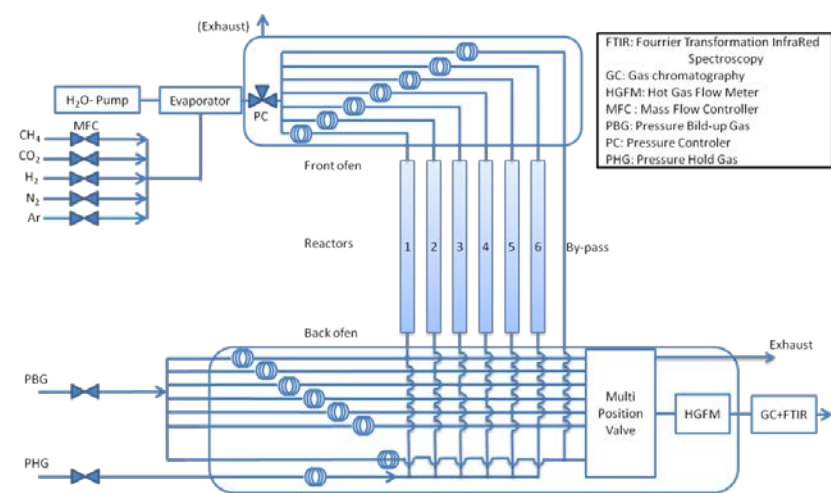


## Catalytic dry reforming of methane

**Background:** Catalytic  $\text{CH}_4$ - $\text{CO}_2$  reforming has been of interest for a long time. It combines  $\text{CH}_4$ , the principal component of natural gas used as source of energy, and  $\text{CO}_2$ , a major problematic greenhouse gas, whereby a contribution can be made to limit global warming. The reaction is particularly interesting because both  $\text{CH}_4$  and  $\text{CO}_2$  are relatively inexpensive feedstocks due to their natural abundance. Therefore it is a good alternative to steam reforming, which is mainly used for synthetic gas ( $\text{CO}/\text{H}_2$ ) production in the industry because it yields lower  $\text{H}_2/\text{CO}$  ratios. Synthetic gas is used for downstream processing including technologies like Fischer-Tropsch catalysis with iron-based catalysts or certain oxo-processes. Many investigations over catalytic methane dry reforming have been reported. Nickel-based catalysts as well as noble metals have been used for the reaction as they are relatively cheap and stable, respectively.



Experimental reactor setup

**Project:** There is a strong interest in a better understanding of the heterogeneous chemical reactions on the catalytic surface at high-temperature ( $800^\circ\text{C}$  -  $1000^\circ\text{C}$ ) and elevated pressure (20bar). Processes and catalysts for dry reforming of methane at low pressure levels are well known and established. However, these processes require that the generated CO-rich syngas is compressed to the pressure level of the corresponding downstream processes. Post-compression of syngas with high CO contents is technically not an easy task. Therefore there is a high incentive to expand the technical scope of dry reforming technology towards higher pressure levels. Our research focuses on developing and designing new catalyst and process options for the reforming of  $\text{CH}_4$  with  $\text{CO}_2$  at elevated pressure. Coke deposition is thermodynamically favored due to the high pressure levels and high temperatures also promote active metal sintering. In order to assess these life-time limiting factors for potential catalyst candidates, an intensive study was conducted on Pt- and Ni-based catalyst, both with simulation and experimentally, to reach a better understanding of the catalyst system under high severity conditions.

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