Project updated: 13.12.2019

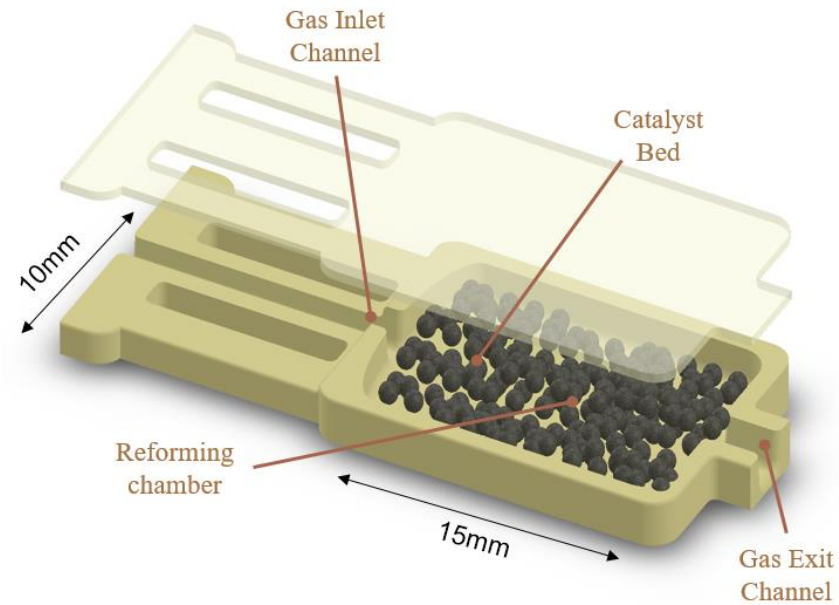
Catalyst assisted micro-reforming in miniaturized fuel cells for on-board H_2 production

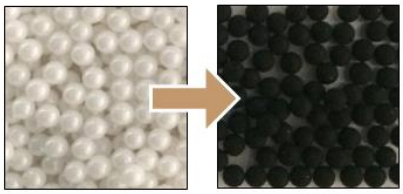
Master Thesis

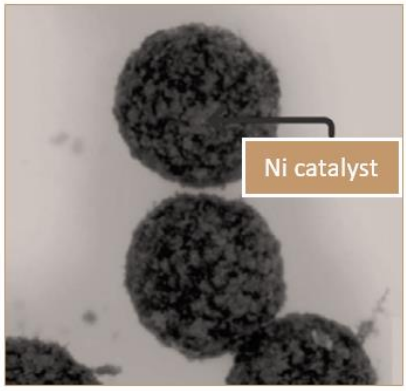
(Section: microengineering, material science)

Going toward the fourth industrial revolution, offering a connected world, raises the urge of finding reliable power sources for off-grid smart technologies. Miniaturized fuel cell technologies, independent from weather conditions and electrical grid, are the perfect candidate for covering the growing energy demand toward a clean, sustainable and highly efficient energy conversion. The development of these technologies is closely related to the hydrogen economy, which is facing great challenges, including difficult storage and stringent safety measures.

We developed a miniaturized ceramic reactor for the on-board hydrogen production by converting hydrogen-containing compounds (biogas, propane and butane), in a process called reforming. During the reforming, a mixture of fuel and air passes through a porous medium containing a suitable catalyst, which activates and enhances the reaction, and is converted in syngas (H_2+CO) by partial oxidation at high temperature.







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The goals of the project are to develop the micro-reformer chamber and to perform a systematic study of the effect of catalyst composition, porosity level and incorporation methods on the gas conversion efficiency.

The project will give you the opportunity to join the journey of a startup development, working on miniaturized solid oxide fuel cells.

Work description:

- Design of a thermo-mechanically stable micro-reformer
- Design of a self-sustaining micro-reformer for high operating temperature
- Evaluation of the micro-reformer performance in real application with incorporated fuel cell membrane
- Expansion of the technology for higher grad systems

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