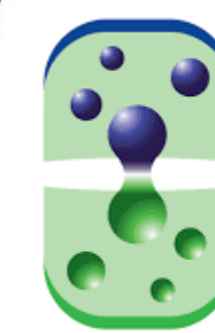


Flexible Hybrid separation system for Hydrogen recovery from Natural gas Grids

Maria Nordio, Fausto Gallucci, Martin Sint Annaland, Vincenzo Spallina



Multiphase
Reactors
Group
Department of
Chemical Engineering & Chemistry



Contact:
Phone number: +31 40 247 2141
Email: M.Nordio@tue.nl

Introduction

The importance of hydrogen is related to the possibility to produce electricity in the fuel cells avoiding the mechanical conversion of the traditional thermo-electrical plants.

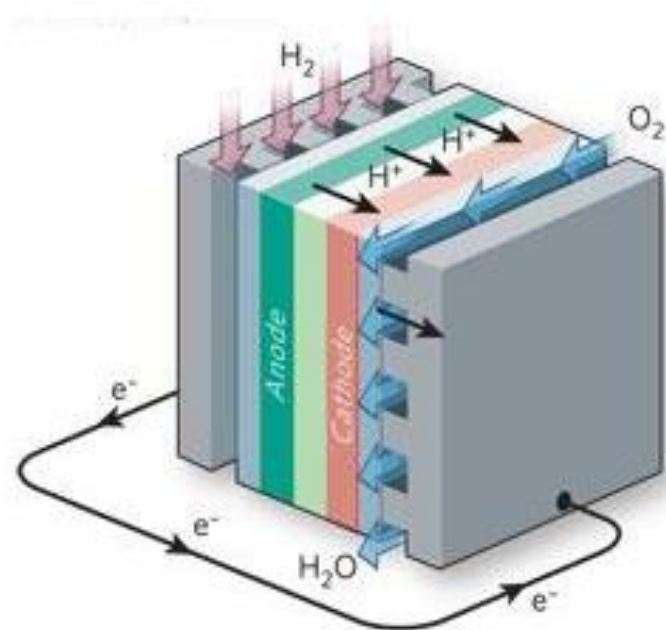


Figure 1. Fuel cell system

Objectives

- Design, scale-up and demonstration at industrially relevant conditions of a novel membrane based hybrid technology for the direct separation of hydrogen from natural gas grids.
- Targets: hydrogen separation system with power of $< 5 \text{ kWh/kg}_{\text{H}_2}$ and costs of $< 1.5 \text{ €/kg}_{\text{H}_2}$.
- Output pilot designed for $>25 \text{ kg/day}$ of hydrogen will be built and tested.



Figure 2. Partners of the project

Advantages

The smart combination and sizing of the three technologies will allow obtaining high recoveries of hydrogen at very low costs. The process can also be extended to other hydrogen recovery systems with low hydrogen content.

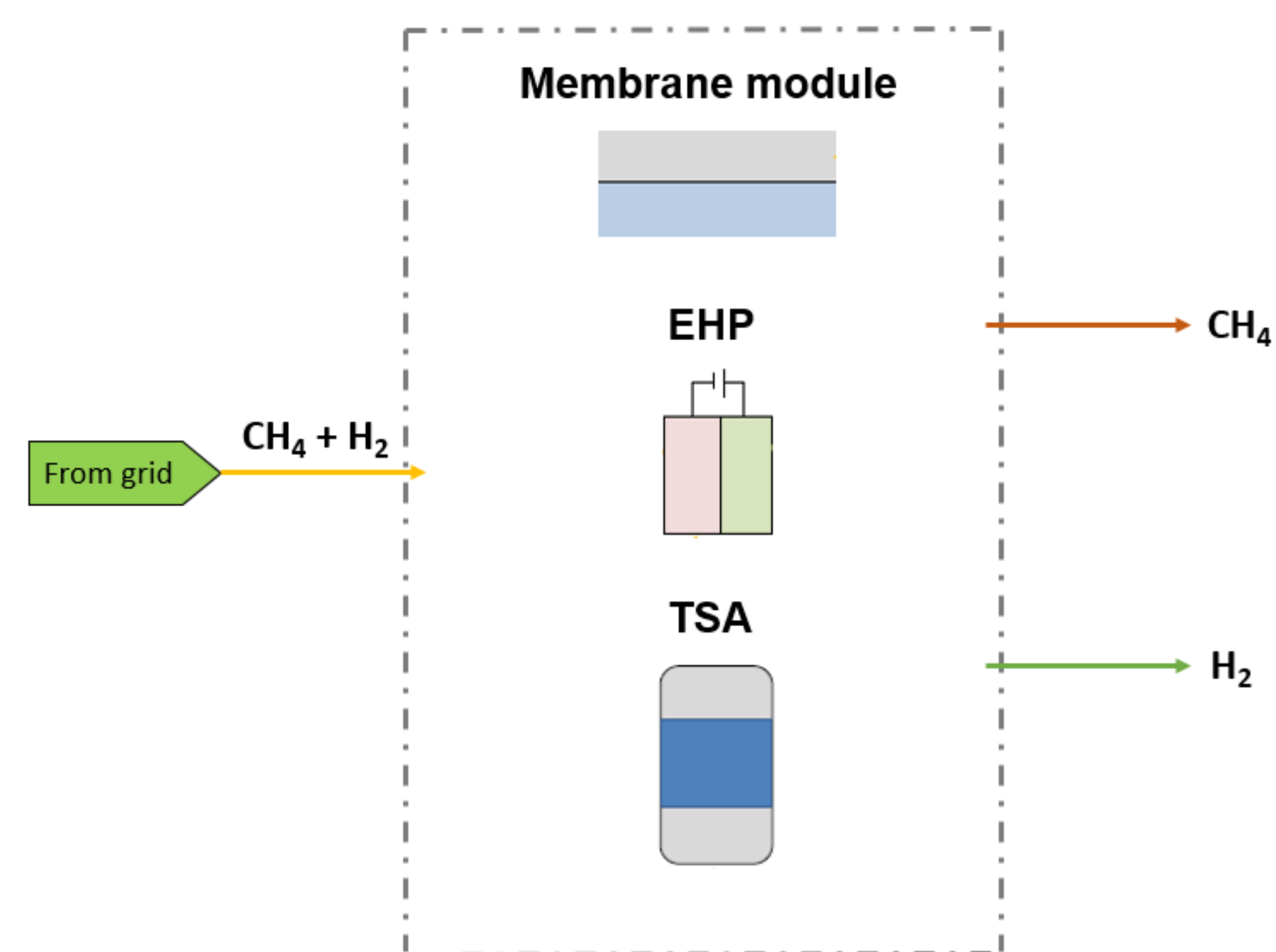


Figure 3. Hybrid system from natural gas to pure hydrogen

Experimental and modeling approach

- Define of the reference case and sizing of the HyGrid pre-commercial scale plant
- Experimental tests with Pd-Ag and carbon membranes to increase permeability and reduce the costs of the system.
- Thermogravimetry analysis to analyze the difference of composition with the temperature for a better understanding of temperature swing adsorption system.
- Modeling of the prototype system in order to implement the economic analysis.

Acknowledgements

This project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking under grant agreement No 700355. This Joint Undertaking receives support from the European Union's Horizon 2020 research and innovation programme and Hydrogen Europe and N.ERGHY