HYGRID

FLEXIBLE HYBRID SEPARATION SYSTEM FOR H2 RECOVERY FROM NG GRIDS

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WP3 – Membrane development

D.3.5
Report on the manufacturing and characterization of the membranes delivered for the pilot scale module

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PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
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Content

1. EXECUTIVE SUMMARY

1.1. Description of the deliverable content and purpose

This deliverable reports the preparation and preliminary characterization of the ceramic supported thin Pd-based membranes delivered to TUE for the pilot scale module. In total 75 sealed membranes were delivered to TUE (65 membranes will be integrated in the prototype module). The membranes are composed of thin Pd-Ag membranes (up to ~5 microns thick) deposited by electroless plating at TECNALIA onto 14/7 mm asymmetric finger-like alumina supports (100 nm pore size). The average length of the membranes after the sealing is 43,4 ± 4,9 cm. The membranes meet the target on N_2 permeance (leakage) at room temperature defined in the project for the membranes in the prototype.

2. Manufacturing and characterization of membranes for prototype

The goal for the prototype is to prepare 75 sealed Pd-based membranes with a N_2 leakage level lower than 3 x 10^{-10} mol m^{-2} s^{-1} Pa^{-1}. The procedure for membrane manufacturing consists on:

a) quality check of the porous supports as received

c) deposition of thin Pd-based membrane onto the tubular supports by electroless plating

d) sealing of the membranes using Swagelok-graphite based connectors

d) quality check of the sealed membranes

The membranes are composed of thin Pd-Ag membranes (up to ~5 microns thick) deposited by electroless plating at TECNALIA onto 14/7 mm asymmetric finger-like alumina supports (100 nm pore size). Membranes have been delivered to TUE in different batches. The quality control of all the membranes has been carried out at TECNALIA before the delivery to TUE. The average N_2 leakage was 1.01 x 10^{-10} mol m^{-2} s^{-1} Pa^{-1} (being 2σ:1.44 x 10^{-10} mol m^{-2} s^{-1} Pa^{-1}). The average length of the membranes after the sealing was 43,4 ± 4,9 cm and the total membrane surface area 1.43 m^2. When considering the best 65 membranes for the prototype the N_2 leak is 8.08 x 10^{-11} mol m^{-2} s^{-1} Pa^{-1} (2σ:1.05 x 10^{-10} mol m^{-2} s^{-1} Pa^{-1}), being the total membranes surface area 1.24 m^2.

In Figure 1 some of the delivered membranes are shown.

Figure 1. Finger-like ceramic supported thin Pd-based membranes prepared for the prototype

Once the membranes are arrived to TUE, a visual inspection is carried out in order to check if any of them is broken during transportation or should be replaced. Then, the metallic dense tube is connected to the Swagelok sealing and quality check is completed before their integration in the prototype module.