MEASURED

Membrane scale up for chemical industries

FOCUS ON SCALED-UP OPTIMIZED COMPOSITE MEMBRANE FOR MD TESTING, OPTIMIZED CMSM MEMBRANES FOR GAS SEPARATION PROTOTYPE, SCALED-UP HYBSI MEMBRANES FOR PV PROTOTYPE

As the MEASURED project advances, key milestones have been reached in the development and scale-up of innovative membranes for industrial applications.

This project newsletter highlights progress across three main work streams: advanced PVDF-based membranes for membrane distillation (MD), carbon molecular sieve membranes (CMSM) for gas separation, and acid-resistant HybSi membranes for pervaporation (PV). From lab-scale breakthroughs to industrial prototype readiness, our partners—including CNR, UNICAL, GVS, TEC, TUe, TNO, and CTI—are driving forward the technical foundations that will power the next phase of pilot testing.

Read on to explore how MEASURED is turning membrane innovation into scalable, high-performance solutions.

FOCUS ON SCALED-UP OPTIMIZED COMPOSITE MEMBRANE FOR MD TESTING

As part of Task 3.1, CNR, UNICAL, and GVS have collaborated on the development and scale-up of advanced PVDF-based membranes for membrane distillation (MD), using environmentally friendly solvents and scalable coating technologies. Two parallel lines of activity were implemented. In Line 1, CNR developed supported membranes using the green solvent and functionalized them with the superhydrophobic coating. These membranes will be used in a small-scale CWT Air Gap Membrane Distillation (AGMD) prototype. In Line 2, GVS and CNR successfully transferred the superhydrophobic coating process to roll-to-roll industrial equipment, applying it to commercial PVDF membranes. The resulting membranes showed excellent hydrophobicity, mechanical integrity, and stable performance in AGMD using industrial rinsing water. The AFAS-GVS0.45 membrane emerged as the most promising candidate for pilot testing, maintaining stable fluxes and hydrophobicity after 100 h of aging. The next steps involve assembling and testing scaled-up supported membranes in the proof-of-concept setup and industrially coated GVS membranes into the CWT AGMD pilot.

OPTIMIZED CMSM MEMBRANES FOR GAS SEPARATION PROTOTYPE

As part of Task 3.2, TEC and TUe are collaborating in the development of carbon molecular sieve membranes for upgrading the outlet stream of a CO2 methanation reactor to gas grid specifications. In the previous months, the permeation properties for the process were established based on thin carbon molecular sieve membranes containing nanoparticles of boehmite (AlO(OH)) (Al-CMSM) supported on 15-20 cm long porous supports 10/7 mm (outer/inner diameter). The permeation properties of these membranes were studied in single gas tests and in mix-feed permeation tests, both with a ternary mixture with low H2 partial pressure (containing 3%vol. H2) and with high H2 partial pressure (containing 20%vol. H2). Modifying the

preparation conditions, Al-CMSMs on 50 cm long and 14/7 mm supports, with the required permeation properties, were prepared. The next step will be the evaluation of these membranes in mixture permeation tests and the large-scale production of Al-CMSM to prepare 1.2 m² of membranes for the prototype.

SCALED-UP HYBSI MEMBRANES FOR PV PROTOTYPE

As part of task 3.3, TNO and CTI worked on scaling up of HybSi Acid Resistant (AR) membranes on CTI Multi-Channel (MC: 7-channels) supports with a length of 1178 mm. The supports were supplied by CTI with a pore size of 200 nm to TNO to apply its sequential coating method. Initially, TNO produced one batch of MC HybSi AR membranes on 2 CTI supports and shipped them to Orelis for pervaporation tests. The test results suggest selective membranes with low permeability. Therefore, TNO produced another batch on 2 CTI supports attempting to improve the permeability of the scaled-up membranes. This new batch has been delivered to Orelis to be tested for the pervaporation process which is currently ongoing. As a parallel route, CTI has been working on its approach to coat HybSi AR layer on CTI MC supports containing zirconia layer with pore sizes of 8 kDa and 15 kDa. These endeavors did not result in selective membranes and therefore, the TNO's approach will be followed by CTI for production of 3 m2 (21 membranes) of MC HybSi AR membranes for pilot demonstration. These membranes will be produced by October 2025 by CTI, and will be assembled in 3 modules to be delivered to the pilot unit in Arkema.


PARTNERS

Want to know more about MEASURED?

www.measured-project.eu @measuredproject /company/measured-project

Subscribe to the MEASURED newsletter

Funded by the European Union under grant agreement N° 101091887. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or HaDEA. Neither the European Union nor HaDEA can be held responsible for them.