INNOMEM

Membrane intensified processes for Biogas upgrading to Biomethane and Methanol (BIOMETH)

THE GOAL

In the BIOMETH service project, highly innovative membranes are used to upgrade the biogas produced by MESOPOTAMIA ENERGY SA by separating it into biomethane and CO_2. In a second stage, the CO_2 is converted via hydrogenation into readily transportable methanol. The recovered methane, which is 82 times more potent than CO_2 in terms of global warming potential, is fed into the natural gas grid.

BIOMETH NANO ENABLED MEMBRANES

To achieve this goal highly innovative membranes are being developed, namely: oriented graphene oxide hollow fibre membranes with high CO_2 permeance >700GPU and highly innovative water-selective Molecular Sieving (MS) dehydration membranes.

BIOMETH MEMBRANE INTENSIFIED PROCESSES

(a) High CO_2 permeance membranes are used to lower the cost of CO_2 separation by 40%, bringing the cost down to $40 per ton of CO_2 captured.

(b) The captured CO_2 is hydrogenated to efficiently produce readily transported green methanol.

Two proposals have been submitted to MESOPOTAMIA ENERGY SA for the cost-effective CO_2 hydrogenation (a) a multistage tubular reactor methanol by removing water at the end of each stage and (b) the deployment of the MS dehydration membranes to effectively remove the water, to shift the equilibrium and enhance the CO_2 conversion and reduce the cost of catalyst by minimizing the catalyst poisoning by water.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862330

THE RESULTS

The execution of the BIOMETH democase service has focused on two major issues to assist MESOPOTAMIA ENERGY SA in selecting the most appropriate technologies to upgrade the biogas produced, namely:

(a) The proposed two-stage, readily monitored and controlled polymeric membrane system for biogas separation into biomethane and CO_2 is more suitable than conventional amine technologies and should be selected by MESOPOTAMIA ENERGY SA for the production of biomethane.

(b) The proposed molecular sieving membranes, with high H_2O/H_2 selectivity and high water permeance, outperform zeolitic and other molecular sieving membranes. They can be readily upscaled and are the best option to tackle the issue of disposing of pure CO_2 after biomethane removal.

CONCLUSION

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