

Industrial DME via Sorption-Enhanced DME Synthesis (SEDMES)

Publieke samenvatting / Public summary

Aanleiding

To combat climate change, industrial processes, products and feedstock need to become climate neutral, and industrial cycles have to be closed by 2050. Already a great deal is required from the Dutch industry to achieve the targeted emission reductions of 19.4 Mton CO₂ by 2030. Carbon capture, utilisation and storage (CCUS) technology can enable the industry to achieve the short term 2030 targets while continuing to build an industry that can be circular in 2050. Reuse of industrial residual gases (CO/CO₂) supports the transition towards the circular use of raw materials, provided the energy input comes from renewable electricity, green hydrogen. Novel processes need to be developed for the effective and efficient reuse of residual gases.

Doelstelling

iDME will establish a benchmark for energy and cost efficient reuse of residual gases, by establishing technology for dimethyl ether (DME) synthesis, enabling the much-anticipated role of DME as an industrial fuel and platform chemical. As such it provides an essential element in closing industrial cycles. The novel Sorption-Enhanced DME Synthesis (SEDMES) process, comprising in situ steam removal with a solid adsorbent, ensures high CO₂ conversion efficiency to DME in a single unit operation. The in situ removal of steam, shifting the equilibrium to the product side, has been shown to enhance catalyst lifetime and boost process efficiency, specifically in the case of diluted CO₂-rich gas streams. The latter

Projectinformatie / Project information

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Algemene informatie / General information

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is typical for industrial residual gases. In the project, the economic perspective and the environmental impact of the iDME concept, without the requirement of CO₂ capture prior to its utilisation, will be investigated and further improved by process design and development, thereby improving the economic perspective of CCUS in the industry.

Korte omschrijving

The project objective will be achieved by a consortium of key industrial partners, bringing together various stakeholders necessary to implement the full value chain. The main activities are divided in four areas of research and development: 1) enabling material research, 2) process modelling and design, 3) long duration experimental validation for 3 use cases and 4) evaluation of economic potential and environmental impact by business case studies, and developing the roadmap for commercial implementation beyond 2023. TNO leads the development of SEDMES technology. TechnipFMC contributes in modelling and design work. Together with Tata Steel, they will take the lead in developing business and use cases for the SEDMES technology, and develop a roadmap for the integration of the technology into the energy transition economy.

Resultaat

The result of the project will be an optimised industrial DME production process, which includes an extensive experimental validation of sorption-enhanced production of DME from CO₂, for 3 industrial use cases. This will be supported by a better understanding of material stability under the relevant sorption-enhanced conditions and direct operation on simulated residual gases. The economic and environmental impact will be quantified in the form of production economics and a GHG emission reduction potential analysis. Finally, a commercial implementation plan, including follow-up onsite pilot testing, is developed.

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.

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