PROducts of Value from various CO2 sources, Enabled by Integrating Technologies

Publieke samenvatting / Public summary

Aanleiding

CO2-emitting industries must reduce their greenhouse gas emissions to limit global warming while maintaining their competitiveness. Technology exists to capture off-gassed CO2. The question is what to do with it once it is captured. Methanol is currently produced from natural gas overseas and exported to Europe. Methanol is a building-block to produce numerous materials in the Netherlands, including Twente. Technologies exist that could collect the off-gassed CO2 from industry and produce methanol locally. The problem is that this technology is not efficient enough to make methanol at a competitive price. The partners in the PROVE IT project include methanol-users, technology developers, CO2 off-gas producers and energy producers. The project also involves system integration researchers and catalytic R&D businesses. The location of the project in Twente gives the project a large market and increases the success-factor of the project. Transforming petrochemically-based technology to a captured CO2 off-gas based technology is a major step to a sustainable carbon life cycle within the chemical industry that increase job creation.

Doelstelling

In the MOOI theme 'Industry', the PROVE IT project fits in the sub-theme 'Industry'. Furthermore, as proscribed in the 6th part of Mission C in the Multiyear Mission-driven Innovation Program (MMIP6) in Energy and Climate under the Integral Knowledge and Innovation Agenda (IKIA), this

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Publicaties en materialen / Publications and attachments

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project works on the innovation assignment 'System Analysis' and 'Sustainable processes for high-value bulk chemicals from CO2'. In the 'system analysis' assignment, methanol production directly from CO2 was held back for decades by inconsistent production and capture of the building blocks for this process. Until recently, integrating this on a systems scale was impossible. In this project we will solve this. For the 'sustainable processes' assignment, direct CO2-to-methanol conversion technologies have been developed in the past to prove the concept. The technology is currently still inefficient. Many aspects of the process need to be improved. PROVE IT will improve the conversion technology itself and develop optimal catalytic conditions for converting CO2 from industrial off-gasses into methanol.

Korte omschrijving

The project lasts approximately three years. We have divided the project into three result areas. Each result area is divided into separate activities. In result area 1, we will explore the availability of carbon sources and assess the development of demand and value of its derivatives for CO2-to-methanol production. The answers will be the basis for decision-making on investing to scaling-up this new technology. It will also help policy makers to recognize the need to adjust incentives, penalties and regulations. In result area 2, we will define the optimized catalyst productivity, selectivity and lifetime for producing methanol from an off-gas CO2 source. High-throughput experimentation will be deployed in combination with process simulations to assess catalyst deactivation and activity over time with varying process conditions, feed-stream and recycle compositions. Result 3 showcases the utilization of CO2 to produce methanol on an operating production site in the Netherlands. The objective of the long-term field lab is to confirm the catalyst productivity, selectivity and lifetime without compromising the methanol yield, using pure captured CO2 from the Twence plant.

Resultaat

PROVE IT will enable methanol to be produced from

captured industrial CO2. While we initially tailor the catalytic reactor in Twente, eventually the project's catalytic reactor has potential applications at other CO2 point sources such as the port of Rotterdam. The impact of this project will lead to a significant portion of the MMIP – Closing industrial chains CO2 emission reduction target in the IKIA, stated to be 35Mton CO2/year for industry. Since CO2 production is not a limiting factor, the limit to the CO2 conversion is the methanol market. The methanol market in Europe in 2017 was 7,5 Mton methanol/year. 7,5 Mton of methanol/year is equal to a CO2-savings of approximately 10 Mton CO2/year in Europe. Another result is the social impact of a clean-technology-based and systems-integrated economic ecosystem in Twente. An CO2-to-methanol conversion plant would employ hundreds of people locally, and provide research and development jobs. All of this while promoting a clean environment.

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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