PRESS RELEASE

Fraunhofer ISE: Dimethyl Ether Could Be the Game Changer for the Hydrogen Economy

To ensure energy security and achieve its climate protection goals, Germany will import large quantities of hydrogen in the future. Dimethyl ether (DME) is an environmentally friendly, non-toxic, efficient, and economically attractive gas that shows great promise as an energy source for hydrogen and its derivatives. The Fraunhofer Institute for Solar Energy Systems ISE has developed a new, particularly energy-efficient synthesis process for its production, which could become a game changer for DME production and thus for the hydrogen economy. In the international "Power-to-MEDME" project, the entire process chain for large-scale production of methanol and DME in Chile was researched on this basis.

"Dimethyl ether is the hidden champion of the hydrogen economy, not only because it has a significantly higher volumetric energy density than ammonia, which has been the most commonly used fuel to date, making it an ideal candidate for import. It is also a renewable alternative to fossil raw materials as a platform molecule in areas such as the chemical industry and mobility," explains Dr. Elias Frei, Head of the Hydrogen Division at Fraunhofer ISE. The institute therefore wants to work with industry on a new key topic to promote new DME applications and market developments made possible by current research results.
The DME market, which currently comprises more than 5 million tons/year, will grow many times over due to new applications (e.g., blending in Liquified Petroleum Gas, LPG, and platform molecule for fuels). "The global LPG market comprises around 200 million tons per year. Added to this is the market for the production of sustainable aviation fuels, which is estimated to reach up to 400 million tons per year by 2050. This shows the enormous potential of DME," explains Dr. Achim Schaadt, Head of the Sustainable Synthesis Products Department.

New process revolutionizes production

DME is not an unknown gas: many people are familiar with it as a propellant in deodorants, and it is also already used as a solvent and coolant. However, DME is currently produced using a complex and energy-intensive process, which reduces the overall efficiency of converting renewable energy into DME. This is where the INDIGO process developed at Fraunhofer ISE comes in: simultaneous synthesis and distillation greatly simplifies the process, increasing efficiency and reducing costs by more than a quarter compared to the conventional DME synthesis process. The "Power-to-MEDME" re-

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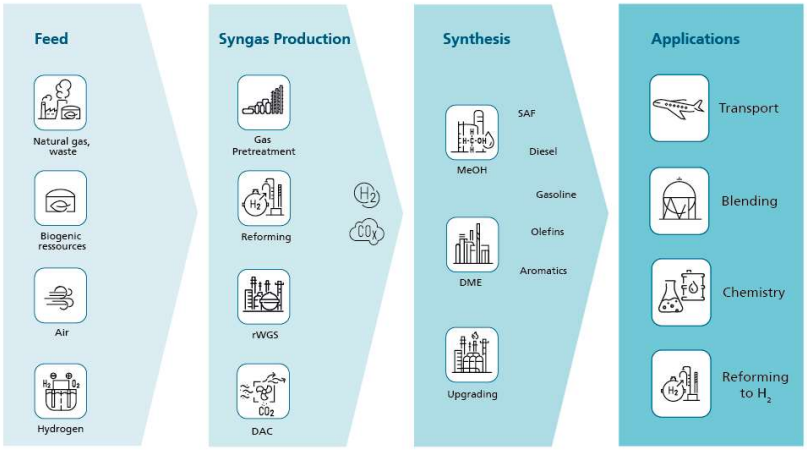
search project showed that in all six cases analyzed, the INDIGO process is more cost-effective than the conventional reference. The process requires less energy because the heat released by the reaction flows directly into the distillation column. As a low-energy process, it is particularly suitable for remote regions. In the importing country, DME can then be split back into hydrogen with maximum yield, for example in a steam reforming process.

DME production planned for Chile

The international research project "Power-to-MEDME" aims to tap Chile's potential for the production of CO2-neutral energy sources with the help of the new INDI-GO process. The conditions for this have been created in this project. The next step is to set up a pilot plant for the production of green methanol and DME in the megawatt range. The research team is supporting this project by analyzing all process steps and developing and testing materials. The aim is to further reduce costs by increasing efficiency and optimizing the integration of various individual processes. The XX simulation tool was used to model the dynamic partial-load operation of the methanol plant in order to obtain practical operating data under fluctuating load conditions.
Fraunhofer ISE has conducted a location analysis to determine which sites in Chile are particularly suitable for renewable power generation and for setting up large-scale production of green hydrogen derivatives. According to the analysis, the Antofagasta region in the north of the country has great potential, as it already produces such high surpluses of solar power (from photovoltaics and concentrated solar thermal energy) that its feed-in to the grid has to be throttled. "In addition to the more efficient use of electricity and local value creation, the project also contributes to the development of the region through the transfer of German technology know-how," explains Robert Szolak, Head of the Sustainable Synthesis Products Department.

The pressure distillation column developed at Fraunhofer ISE reduces the energy requirements, plant complexity, and investment costs for DME production. © Fraunhofer ISE



Overview graphic of DME production, synthesis products and applications. © Fraunhofer ISE

Concentrating solar power plants supply green electricity for methanol and DME production in northern Chile. © Fraunhofer CSET

More Information:
Link Key Topic DME
Link Project EARTH2
Link Project Power-to-MEDME