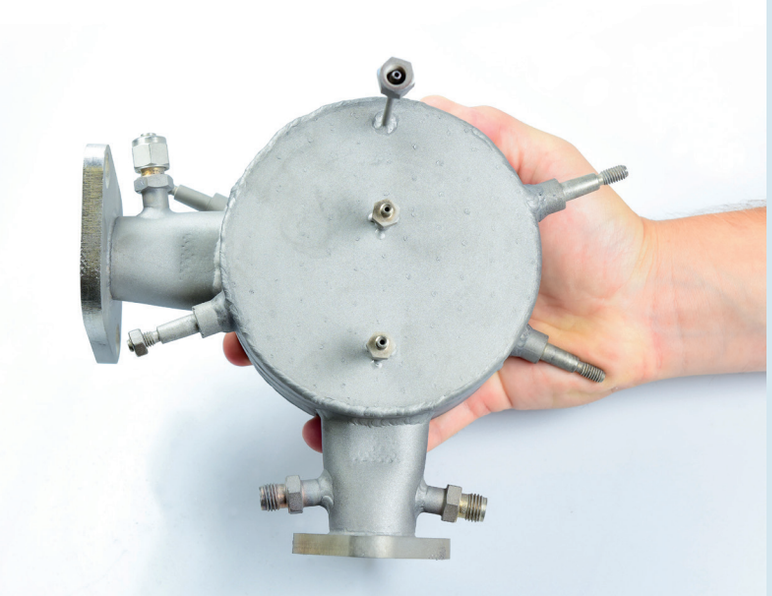
Fraunhofer ISE builds on more than 30 years of experience in heterogeneous catalysis for thermochemical hydrogen and syngas production via reforming reactions. Unlock the full potential of your technology by leveraging our expertise in:

- Development of reactor concepts for different applications and energy carriers, supported by CFD simulations
- Precise process models of use-cases for hydrogen-based synthesis products with Aspen and Chemcad software providing insights into the catalytic process design and optimized operations
- Catalyst characterization to evaluate activity, selectivity, and stability under controlled conditions, giving a deeper understanding of kinetic and thermodynamic boundaries
- Construction and 24/7 operation of pilot-scale testing environments for accurate and reliable results leading to scalable and cost-effective solutions
- In-house software development using LabVIEW (Laboratory Virtual Instrument Engineering Workbench) software for real-time sensor data acquisition, visualization, and control algorithms

CatVap® reactor concept for reforming and oxidation reactions. © Fraunhofer ISE



Further Information

Contacts

Hydrogen Technologies – Sustainable Synthesis Products
Robert Szolak
Phone +49 761 4588-5319
h2fc.thermoprocess@ise.fraunhofer.de

Sustainable Synthesis Products - Application and Characterisation
Florian Rümmele
Phone +49 761 4588-5365

Fraunhofer ISE
Heidenhofstr. 2
79110 Freiburg, Germany
www.ise.fraunhofer.de

04-252320-26

Fraunhofer ISE

Fraunhofer Institute for Solar Energy Systems ISE

Sustainable Synthesis Products

Thermochemical Hydrogen and Syngas Production

www.ise.fraunhofer.de/en/syn

Thermochemical Hydrogen and Syngas Production

Sustainably produced hydrogen and derivatives will play a major role as future energy carriers, as they can be transported and stored in existing infrastructure. Replacing fossil fuels across various sectors and applications will depend on providing optimized upstream syngas compositions and enabling efficient straightforward downstream implementation.

Our Offer

- Developing reforming processes and electrified reactor concepts for energy carriers and fuels (e.g. ammonia, dimethyl ether, methanol, biofuels, e-fuels)
  - with computational fluid dynamics simulations
  - applying Inventor CAD software
- Evaluating use-cases for green hydrogen-based synthesis products by
  - process simulations to reduce cost and energy consumption
  - construction of pilot-scale testing environments
- Characterizing and optimizing catalysts with in-situ and ex-situ analysis
  - reforming catalysts
  - exhaust gas aftertreatment catalysis
- Custom-made process control algorithms for dynamic processes

Syngas Production

We reduce the carbon footprint of applications by utilizing available and low-cost feedstocks for the synthesis of low-carbon molecules. To maximize the impact of this approach, our research covers the entire process chain - from feedstock selection to advanced conversion technologies.

Central to our research are purification and separation methods combined with reforming steps that efficiently utilize biogenic and waste feedstocks - not only as carbon sources but also as hydrogen sources through innovative reforming processes. Our aim is to increase efficiency and lower the net conversion costs of syngas production. In addition, we develop CO_2-sourcing technologies such as direct air capture (DAC) or CO-producing ones via reverse water gas shift reactions (rWGS).

Synthesis Product Applications

A key advantage of DME is its flexibility to be converted into various molecules to meet the requirements of specific applications. Additionally, complete reconversion into hydrogen is possible. Our work focuses on low-temperature reforming processes and catalyst characterization - both at laboratory and pilot scale.

Fraunhofer ISE develops integrated, modular systems and proprietary catalysts for thermochemical hydrogen production to enable the direct use of ammonia in different applications. Our solutions ensure rapid start-up, cost-effective operation, and flexible use across diverse fields.

Synthesis Product Value Chains.