Project motivation

The European Union has set an ambitious goal of achieving climate neutrality by 2050, impacting all sectors – from private households to industrial operations. However, some industrial processes are inherently difficult to decarbonize, as CO_2 is either a necessary feedstock or an unavoidable byproduct. Instead of treating CO_2 as waste, utilizing it as a resource can enable a circular carbon economy, reducing emissions while supporting sustainable industrial transformation.

Project vision and mission

In the SOMMER research project, science and industry collaborate to develop a sustainable technology for converting CO_2 and H_2O into syngas – a key raw material for various chemical products.

The innovation: Heat from concentrated sunlight is directly used as an energy source to drive chemical reactions within a reactor. A specially designed membrane enables this process at significantly lower temperatures, reducing the required heat input from over 2,500°C to below 1,500°C.

The advantage: Unlike electrolysis, which requires green electricity to split CO_2 and H_2O, the SOMMER process operates without electricity. Additionally, thermal energy can be stored cost-effectively for several hours, allowing continuous operation even at night – making 24/7 solar-powered production possible. With core components developed by European companies, the SOMMER technology ensures resilience, sustainability, and energy independence.

Solar Towers in Jülich

Consortium members

DLR Deutsches Zentrum für Luft- und Raumfahrt e.V.	DLR Institute of Future Fuels, Germany
JÜLICH Forschungszentrum	Forschungszentrum Jülich, Germany
IREC Shaping Energy for a Sustainable Future	Institut de Recerca en Energia de Catalunya (IREC), Spain
hte	HTE GmbH The High Throughput Experimentation Company, Germany
CSIC	Agencia Estatal Consejo Superior De Investigaciones Científicas, Spain
TITAN	TITAN Cement Company S.A., Greece
Morgan Advanced Materials Haldenwanger	Morgan Advanced Materials Haldenwanger GmbH, Germany
BASF We create chemistry	BASF SE, Germany

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Funded by the European Union

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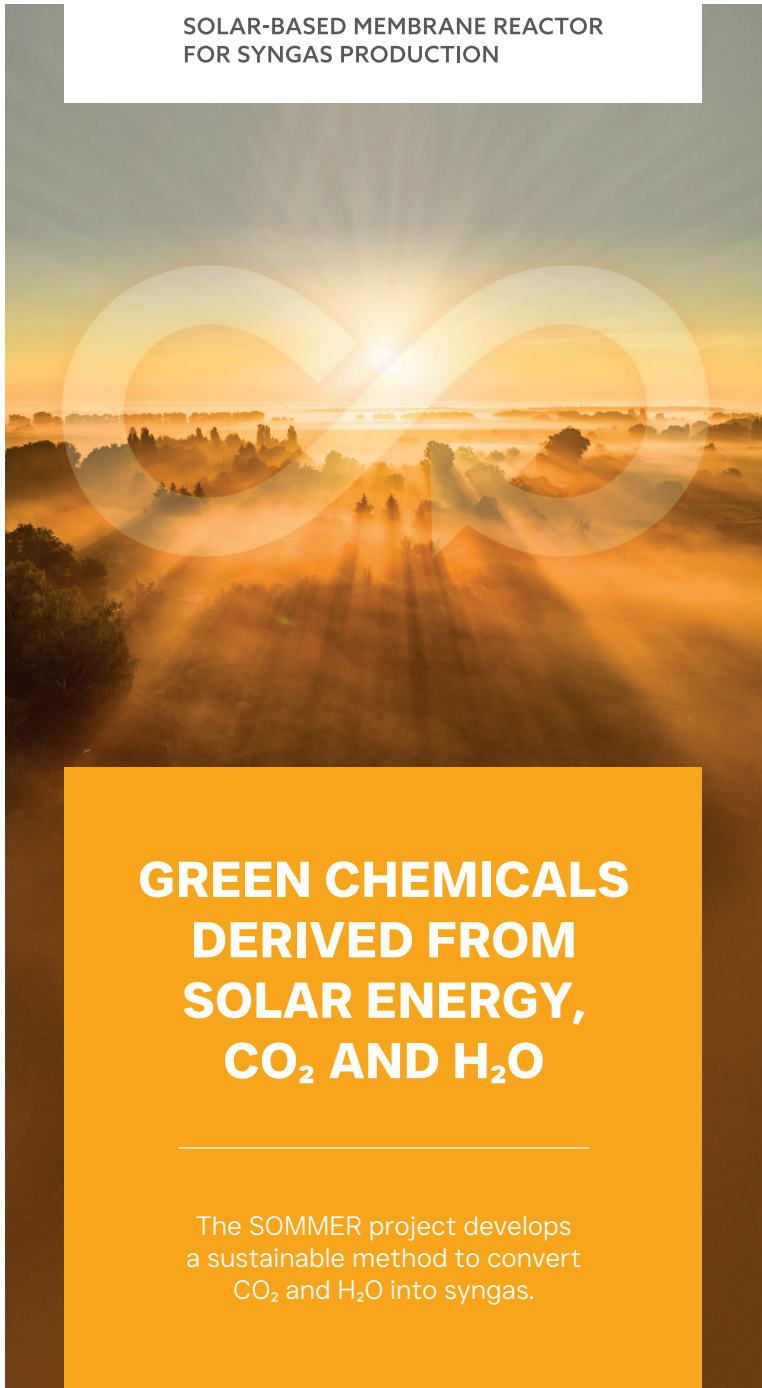
SOMMER

SOLAR-BASED MEMBRANE REACTOR FOR SYNGAS PRODUCTION



GREEN CHEMICALS DERIVED FROM SOLAR ENERGY, CO_2 AND H_2O

The SOMMER project develops a sustainable method to convert CO_2 and H_2O into syngas.

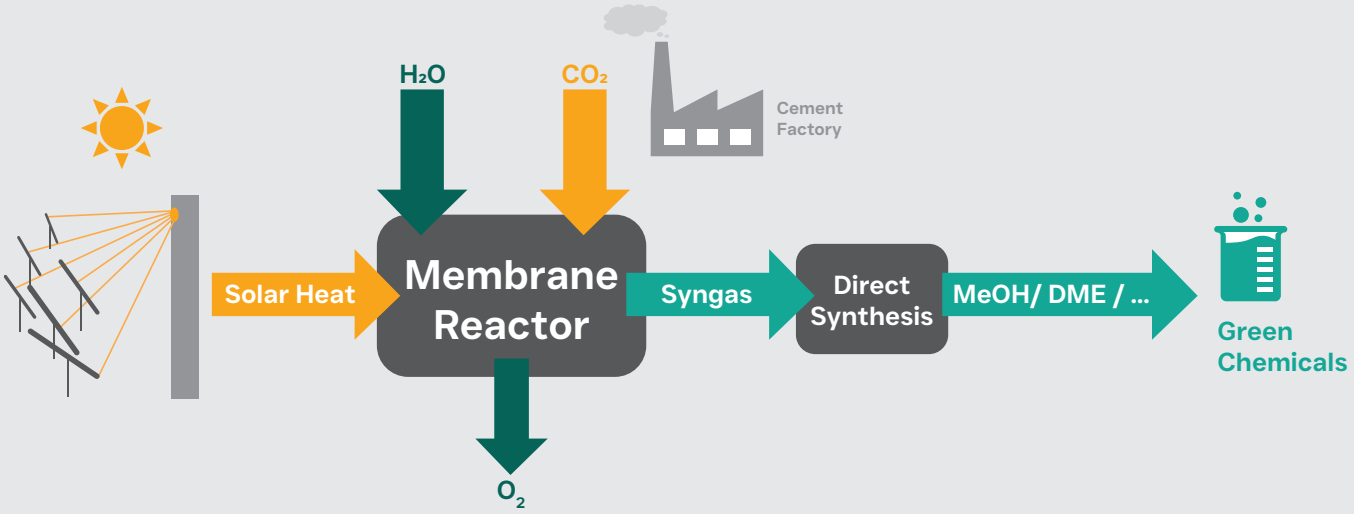
GREEN CHEMICALS DERIVED FROM SOLAR ENERGY, CO_2 AND H_2O

Key features of SOMMER technology

SOMMER aims to develop and demonstrate an innovative carbon-neutral process for syngas production by directly integrating solar energy into a catalytic membrane reactor.

This reactor facilitates the decomposition of H_2O and CO_2 – captured from carbon-emitting industries or through direct air capture.

This approach allows SOMMER to eliminate reliance on fossil-based energy for syngas production, using CO_2 as a feedstock instead of natural gas.



Innovative membrane technology

The solar membrane reformer utilizes cutting-edge membrane technology, enabling the sustainable splitting of CO_2 and H_2O at lower temperatures. This technology offers flexible operation, including the option to use biogas, which enhances the project's resilience. Additionally, the composition of the syngas can be adjusted to meet the specific needs of downstream processes.

Scalability

SOMMER is designed to be a scalable technology that adapts to varying CO_2 needs, linking emissions to downstream processes like methanol production. This strategic approach seamlessly integrates the solar membrane reactor, transforming emissions into valuable resources for the chemical industry.

Circularity

SOMMER's holistic approach transforms unavoidable CO_2 emissions into a valuable product, fully aligned with the principles of a circular economy.

Green feedstock production

SOMMER converts CO_2 and H_2O into syngas, a sustainable raw material that can be used to produce chemicals such as methanol and DME, driving the transition to a green chemical economy.

Concentrating solar technology

In regions with ample solar radiation, concentrating solar plants are both technically and economically viable for providing the necessary heat energy. With the ability to store heat for extended periods, solar energy can be made available 24/7.

Project Facts

Funding scheme:
HORIZON RIA
(Horizon Research and Innovation Actions)

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Climate, Energy and Mobility

Project duration:
01.11.2023 – 31.10.2027
(48 months)

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€ 4,7 million