

SISYPHUS

SPIN-OFF FELLOWSHIP, 2. AUSSCHREIBUNG, 2. EINREICHFRIST (SEPT. 2023)

Projektkurztitel:	Sisyphus
Projektlangtitel:	Sustainable SYngas Production by Highly-efficient CO2 UtiliSation
Antragstellende Organisation:	Montanuniversität Leoben
Fellows:	Dr. Thomas Cotter DI Lorenz Lindenthal
Host:	Univ.-Prof. Dr. Christoph Rameshan
Projektstandort:	Leoben
Laufzeit:	01.02.2024 – 31.07.2025

PROJEKTZIEL:

Sisyphus is inspired by the namesake Greek mythological figure who endlessly rolls a boulder up a hill, symbolizing our commitment to recycling CO₂ and mitigating climate change. To help us achieve this we have developed an innovative catalyst that enables the energy-efficient conversion of CO₂ to valuable products. In the scope of the FFG Spinoff Fellowship we aim to develop a chemical process based around this catalyst to convert CO₂ using green hydrogen producing synthesis gas (syngas). This essential chemical intermediate has been used in industry for over a century and is a critical pathway for the future production of green fuels and chemicals.

The general aim to transform CO₂ into valuable products is known as carbon capture and utilization (CCU). Our approach involves the development of the "reverse water-gas shift" (RWGS) reaction whereby hydrogen and CO₂ react, removing one of the oxygen atoms to form carbon monoxide. This key technology is a necessary first step in the production of sustainable aviation fuel using the established Fischer Tropsch pathway to synthesise the necessary long chain hydrocarbons. Current state-of-the-art technology is based on a high-temperature process that suffers from high capital costs and low energy efficiency due to losses related to heat recycling.

The goal of the Sisyphus project is to develop an alternative, lower temperature RWGS process based on a demonstrated highly active and selective catalyst. The project is multi-faceted; one aspect involves the simultaneous upscaling and forming of the catalyst material to result in a technical catalyst capable of

INFOBLATT

performing in a industrial reactor with several years of effective lifetime. The second important technical workstream involves developing the RWGS process based on real-world, measured performance data of our catalyst. To do this we will model of Sisyphus RWGS process including downstream conversion steps and heat integration. In developing this alternative process and catalyst we aim to increase the end-to-end efficiency in terms of levelized cost of ownership by at least 10%.

The project is currently at a technology readiness level (TRL) of 3-4, our goal is to advance this to TRL 5. This advancement will allow us to demonstrate its potential and validate critical market and customer needs assumptions.

As a result/outcome of our Fellowship we will deliver the basic engineering necessary to develop a technology demonstrator as our minimum viable Product (MVP). To do so we will conduct interviews with customers and partners to understand their needs, defining the scope for a demonstration reactor, and planning for basic engineering and implementation of the demonstrator at the partner's site. We also aim to establish collaboration agreements with early adopters for on-site demonstrations.

Lastly, we will focus on developing key intellectual property (IP) for future commercialization. This includes scouting the IP landscape, developing an IP strategy, and preparing for a patent application for our RWGS technology. By the end of this project, we aim to approach customers with a unique value proposition based on these achievements.

VISION SPIN-OFF:

- A commercial-ready catalyst with exceptional low-temperature performance confirmed in pilot testing.
- Catalyst production capabilities at kg scale developed together with industrial partner.
- Basic engineering of a novel CO₂ conversion process demonstrated by detailed simulations and real-world performance data from pilot and bench scale testing.
- Established partnerships and agreements to implement a technology demonstrator on-site to prove the integrated process concept.
- First customer agreements to collaborate on technology scaling and potential licensing.
- Beyond the FFG Spinoff Fellowship:
 - Found GmbH with clear investment case and revenue model.
 - Establish an MVP in the form of a demonstrator to create a revenue stream in the next 3 years.
 - Demonstrate a robust and high efficiency technology for CO₂-based syngas production that can be reliably scaled to commercial plants >50kT/a.

Weitere [Information zum Spin-off Fellowship](#) finden Sie auf der FFG-Homepage.