



Greenhouse gas and acid gases conversion by electrothermal catalysis

Utilization of H₂S and CO₂ for production of industrially valuable carbon monoxide (CO) and sulphur (S)

Start date 1 September 2022 – End date 31 August 2025

THE e-CODUCT CONSORTIUM



PROJECT INFORMATION



<https://e-coduct.eu/>



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ABOUT e-CODUCT

e-CODUCT tackles the environmental challenge of reducing greenhouse gas and acid gases caused by heating or industry.

Building on successful projects and an interdisciplinary approach, e-CODUCT aims to develop a working pilot plant for an **electrothermal catalytic reactor** powered by renewable energy sources to produce industrially valuable carbon monoxide (CO) and sulphur (S) from carbon dioxide (CO₂) and hydrogen sulphide (H₂S).

ULTIMATE GOAL

Existing technologies have no solution to the challenge of CO₂ conversion, which lies in the composition of streams containing other acid gases (e.g. H₂S), and the economic and environmental inefficiency of reactors. The goal is to develop a **breakthrough technology** that **enables the simultaneous reduction of CO₂ and H₂S** for the production of marketable **green end products** in the form of fuels and useful chemicals (CO, S and CH₃OH).

PROCESS

The e-CODUCT process **electrifies the simultaneous chemical conversion of acid gas components (CO₂ and H₂S) into platform molecule CO and marketable S_x**. The conversion process will involve two steps: the reduction of CO₂ and H₂S to carbonyl sulphide (COS) and the decomposition of COS into CO and sulphur. e-CODUCT will optimise the reactor materials and catalysts and scale up to TRL6 to produce 16 t/year of CO while reducing the reactor size by 50%. The proposed technology is already used in methane cracking for hydrogen and carbon production and could be adapted for other applications such as fluid catalytic cracking, steam cracking and dehydrogenation.

SCIENTIFIC & TECHNICAL OBJECTIVES

- Development of stable and sulphur-resistant catalysts and construction of a pilot-scale reactor to demonstrate the conversion of CO₂ and H₂S into COS
- Development of an operational pilot plant to demonstrate ETFB reactor technology for the conversion of COS into CO
- Validation of the quality of the reaction products and conversion of CO into green methanol
- Construction of reactor and process models with integrated microkinetics for process optimisation and scale-up
- Demonstration of techno-economic and environmental performance of developed e-CODUCT reactors and models via extensive techno-economic evaluation and LCA modelling

Electrothermal fluidised bed reactor

