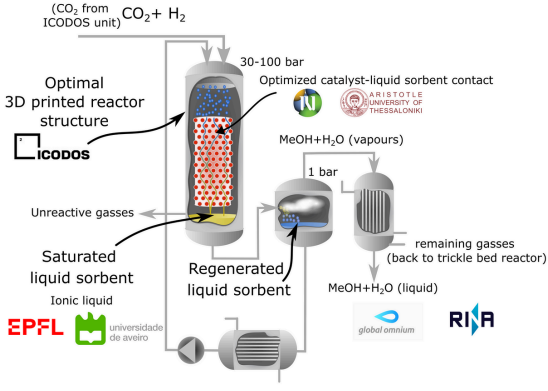
Turning CO_2 into energy storage

first-ever Ionic LIquid sorbent Methanol synthesis In order To Enable over 80% yield

OVERVIEW

The **ILIMITED** project aims to revolutionise the way we convert CO_2 into methanol by developing an innovative and economically viable process suitable for **small, decentralised applications**. Using novel liquid sorbents and advanced catalysis, ILIMITED aims to achieve efficient CO_2 capture and local methanol production, especially in **wastewater treatment plants** and **sustainable fuel** use.

INNOVATIVE TECHNOLOGY



- **Ionic liquid sorbents** - capture & convert CO_2, overcome current methanol yield limitations
- **>80% methanol single pass yield** - outperforms the 60% state of the art
- **In-situ methanol and water removal** to drive reaction equilibrium
- **3D-printed reactor** - improved fluid dynamics and localized use
- **Dual-use methanol** - green fuel & carbon source in wastewater treatment

Funded by the European Union

Project funded by

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KEY OBJECTIVES

- Develop & test **novel low-viscosity and low-vapour-pressure liquid sorbents**
- Demonstrate CO_2 → methanol conversion with **over 80% yield**
- Use **machine learning & Bayesian optimisation** to improve process performance
- Enable **decentralised methanol production** from distributed CO_2 sources
- Integrate methanol utilisation into **wastewater denitrification** to close the loop of local carbon valorisation

EXPECTED IMPACT

- **Reduce greenhouse gas emissions** from distributed CO_2 sources
- Enable **low-pressure methanol synthesis** using biogas-derived CO_2
- Position **wastewater treatment plants as biorefineries**
- Foster a **circular economy** across the energy, waste & water sectors
- Introduce small/local-scale CO_2 & energy storage systems by 2030

TIMELINE & FUNDING

Duration 01.2025 | 12.2027
Total Budget € 3 578 568.06
EU contribution € 2 497 753.75

CONSORTIUM

Coordinator:
National Institute of Chemistry, Slovenia

NATIONAL INSTITUTE OF CHEMISTRY
ARISTOTLE UNIVERSITY OF THESSALONIKI
global omnium
ICODOS
RINA
universidade de aveiro
EPFL

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The ILIMITED Project is funded under Horizon Europe **Grant Agreement n°101192964**