PRESS RELEASE

MAY 2025

ALGAESOL

Celebrating the First Year Advancing Sustainable Aviation and Shipping Fuels from Microalgae, CO_2, and Solar Energy

Biofuel production based on solar energy and microalgae has the potential to **significantly reduce CO_2 emissions** from the shipping and aviation industries. However, it remains at a small scale due to high production costs and challenges in scaling up the technology. The ALGAESOL project aims to advance this technology and contribute to the transition towards a **carbon-neutral transport sector** by developing innovative renewable fuel technologies.

Over three years, ALGAESOL will refine the **conversion of solar energy, CO_2, and organic waste into renewable methanol, methane, and bio-oils** -which serve as the foundation for biofuels. The project aims to develop a low-energy, compact solar technology for cultivating neutral lipid-producing microalgae, utilizing CO_2 and wastewater as carbon sources. To enhance conversion efficiency, ALGAESOL partners from the **University of Girona** and **LEITAT** will focus on key technological advancements in bioelectrochemical systems (BES).

To integrate microalgae into the BES, **NORCE** and **DTI** will select optimized strains, with high lipid productivity and fatty acid composition while implementing strategies to mitigate microbial contamination. The **production of sustainable aviation fuels (SAF) from algal lipids and the purification of methanol and methane into shipping fuel** will also be conducted during the project.

> ***"Beyond advancing the current state-of-the-art, ALGAESOL aims to reduce biofuel production costs by 25% while creating and consolidating new value chains for shipping and aviation fuels based on microalgae and direct solar renewable fuel technologies."***
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> Dr. Dorinde Kleinegris, Project Coordinator

In addition to laboratory validation, the ALGAESOL concept will be digitally modelled by **SIMTECH**, on a customized simulation platform to showcase its full potential. This virtual environment will enable the implementation and performance optimization of two use cases: SAF and shipping fuels -up to technology readiness level 5 (TRL 5). The use cases align with real-world fuel production ensuring industrial conditions and will be validated by **SOCAR** in a relevant industrial setting.

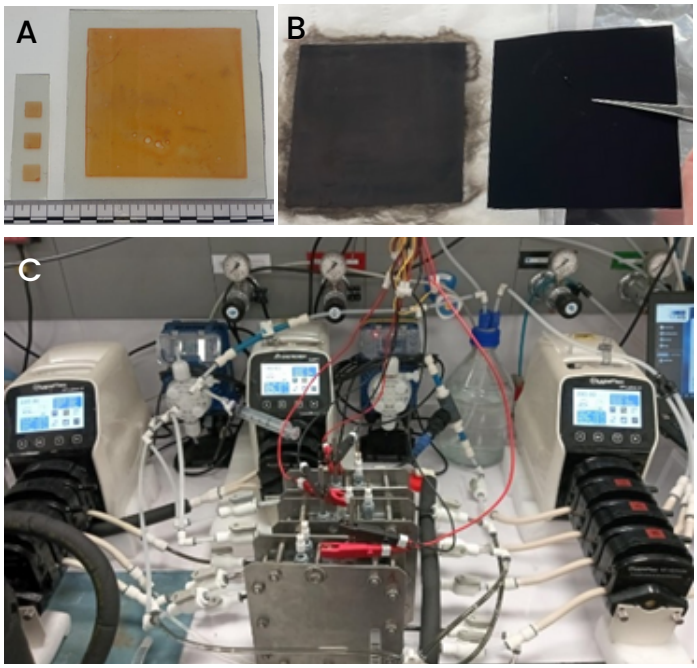

Figure 1. ALGAESOL achievements at M12. Screen printed photoanode (a), Spray-coated electrodes (b) and bioelectrochemical cells (c).

As ALGAESOL mark the end of the first year, we celebrate the technological advancements of:

- Successfully achieving the **first screen-printed photoanodes**: unlocking a new era of scalable, time-efficient, and eco-friendly solar technology (Figure 1a).
- Developing and tuning of **spray-coated electrodes**, including their fabrication, characterization in a 3-electrode system, and integration into a 2-chamber electrochemical flow cell, with a focus on enhancing selectivity for CO_2 reduction to methanol (Figure 1b).
- Stable operation and ongoing optimization of **3 replicate bioelectrochemical cells** with biocathode for electromethanogenesis, to generate CH_4 from CO_2 -with a steady-state current density of 12 A/m^2 and a CH_4 production of ~0.4 L per day (Figure 1c).

"This project is about optimizing BES technologies, integrating and developing the whole production chain from sunlight to the end product, and simulating how it will function at a large scale. The next step after the project will be to scale up all the developed processes to a commercial level, followed by the commercialization of the full value chain," added Kleinegris.

With a strong consortium spanning from lab-scale development to industrial refinery implementation, the Horizon Europe-funded initiative is paving the way for zero-emission biofuel production, accelerating the shift towards a sustainable transport sector.

About ALGAESOL "Sustainable aviation and shipping fuels from microalgae and direct solar BES technologies":

ALGAESOL consortium consist of 6 European partners including research organisation, universities, and private companies: NORCE Norwegian Research Centre AS, LEITAT - Acondicionamiento Tarrasense Associacion, UdG -Universitat de Girona, DTI - Danish Technological Institute, SIMTECH GMBH, SOCAR Petroleum SA and AMIRES SRO.

The project started on May 1st, 2024, and will run for 36 months under NORCE's coordination.

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