# DESIRED

# Direct co-processing of $CO_2$ & water to sustainable multicarbon energy products in novel photocatalytic reactor

## About DESIRED

DESIRED is a high-risk high-return project that aims to establish the technological feasibility and sustainability of a **new fuel production system**. This system, called the DESIRED system, would use **sunlight as its primary energy source to produce multi-carbon energy-rich products from $CO_2$ and water**, using new and recyclable hybrid photo-electrocatalysts, in an innovative photoreactor design combined with direct light irradiation. The DESIRED system will produce **C2+ solar fuels**, as well as C1 species like methanol or methane, to be used directly, or as intermediates to produce drop-in fuels. The project will investigate the economic affordability, environmental benefits, and social acceptability of this approach.

## Consortium

Consorzio Interuniversitario REATTIVITA' CHIMICA e CATALISI

INNOVATIVE CATALYSIS for IC2R srl CARBON RECYCLING srl

instituto iMdea energía

UNIVERSITY OF WARSAW

AEE INTEC

CHARLES UNIVERSITY

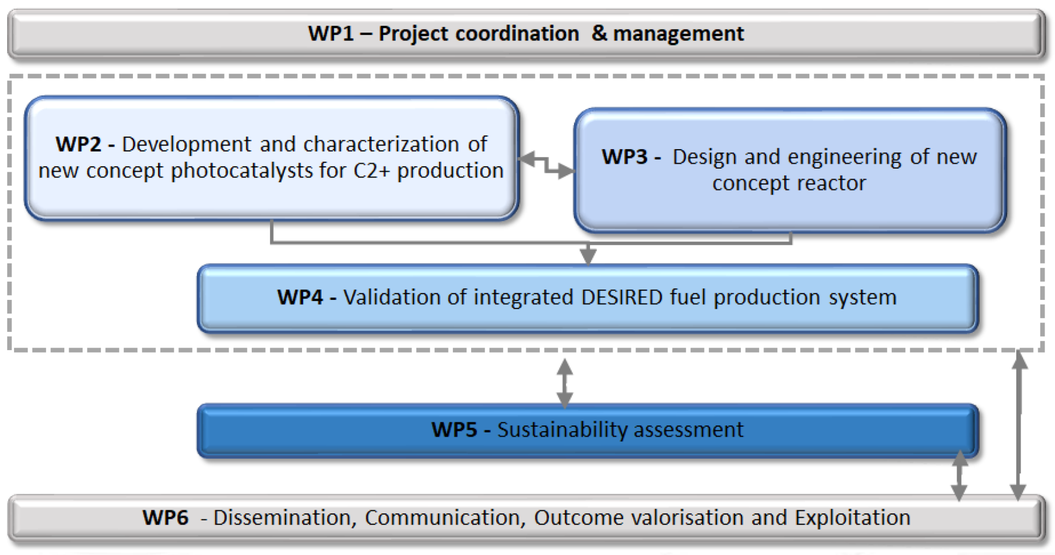
eBOS Engineered for Excellence Driven by Passion for Innovation

## Overall concept

Fossil fuels meet 80.2% of the world's energy demand, but their use is unsustainable and contributes to greenhouse gas emissions. Biomass-derived renewable fuels have limited potential, while electro-fuels and solar fuels significantly reduce emissions and promote a circular economy. Solar fuels also enhance energy security and provide economic opportunities. Transitioning to solar-based technologies can benefit developing economies and countries poor in fossil-C sources, but clean fuel production from sunlight is still in early technological stages.

| Start Date | End Date |
|---|---|
| **1 November 2022** | **31 October 2026** |

*Organization of activities*





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**Funded by the European Union**

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## Ultimate objectives

The DESIRED project's overall objective is to prove the technological feasibility of a novel fuel production system. This system will be designed to **generate multicarbon products (C2+ solar fuels) by direct $CO_2$ and water coprocessing**, using novel and recyclable hybrid photo-electrocatalysts. The uniqueness lies in an innovative photoreactor design, combined **with direct light irradiation**.

The DESIRED objective will be achieved through the following **specific objectives**:

1. Design, develop and optimise **novel hybrid photocatalysts** and their **innovative bio-sourced porous support – frustules** – for $CO_2$ conversion into energy-rich C2+ species.
2. Design and build a **novel photocatalytic reactor** and develop and integrate selective and stable photocathodes for multielectron $CO_2$ reduction in Photoelectrochemical Cells experiments.
3. **Engineer the DESIRED fuel production system**, validate solar fuel production at a laboratory under simulated and real sunlight conditions, characterise and evaluate the solar fuels, and conduct technology transferability studies.
4. Assess the environmental, social, and economic implications of the technologies developed in DESIRED through **integrated life cycle sustainability assessment.**
5. Maximise the impact of the project through **wide dissemination, communication, exploitation**, and standardisation actions.

## Contact Information:


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