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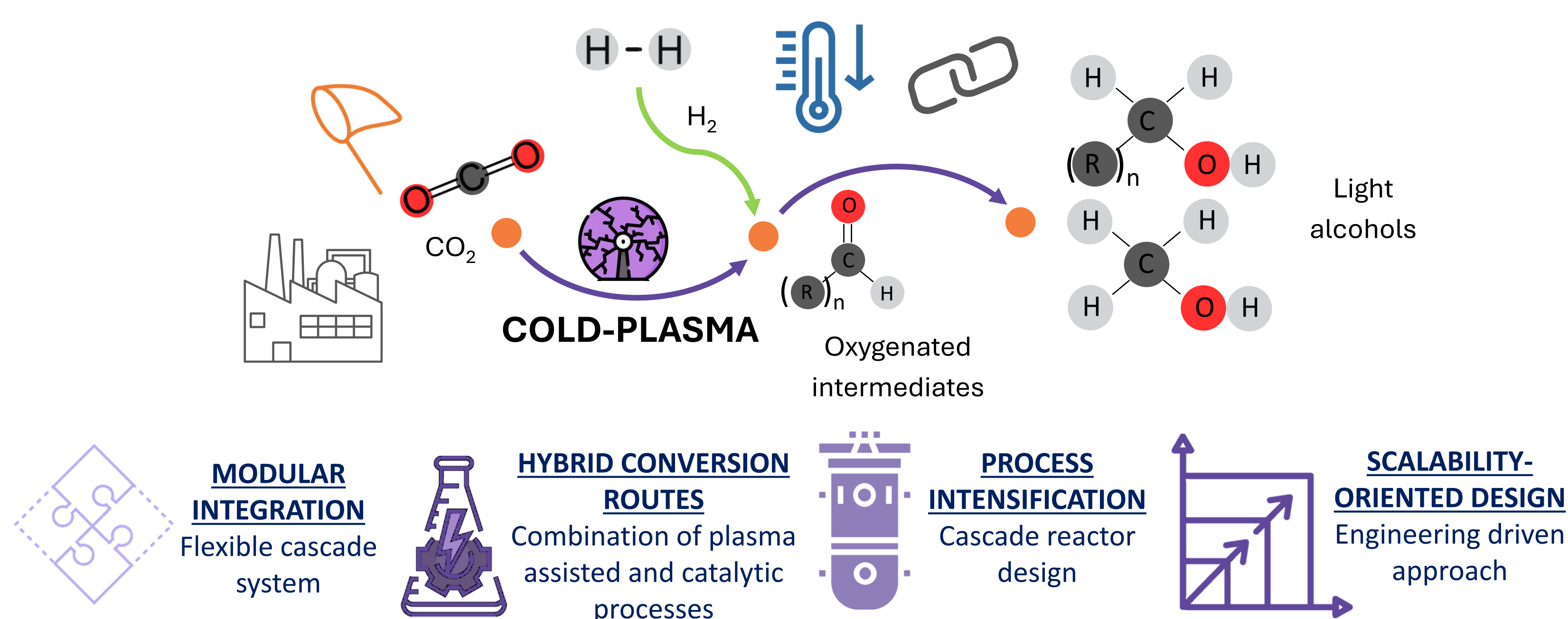
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Introduction and Aim

CO₂ valorisation is a key strategy for achieving a **circular carbon economy** and enabling the transition away from fossil fuels in the energy system. Modular Power-to-Fuel concepts integrating catalytic and plasma-assisted processes offer a promising route, although challenges remain in process integration, selectivity, and scalability.

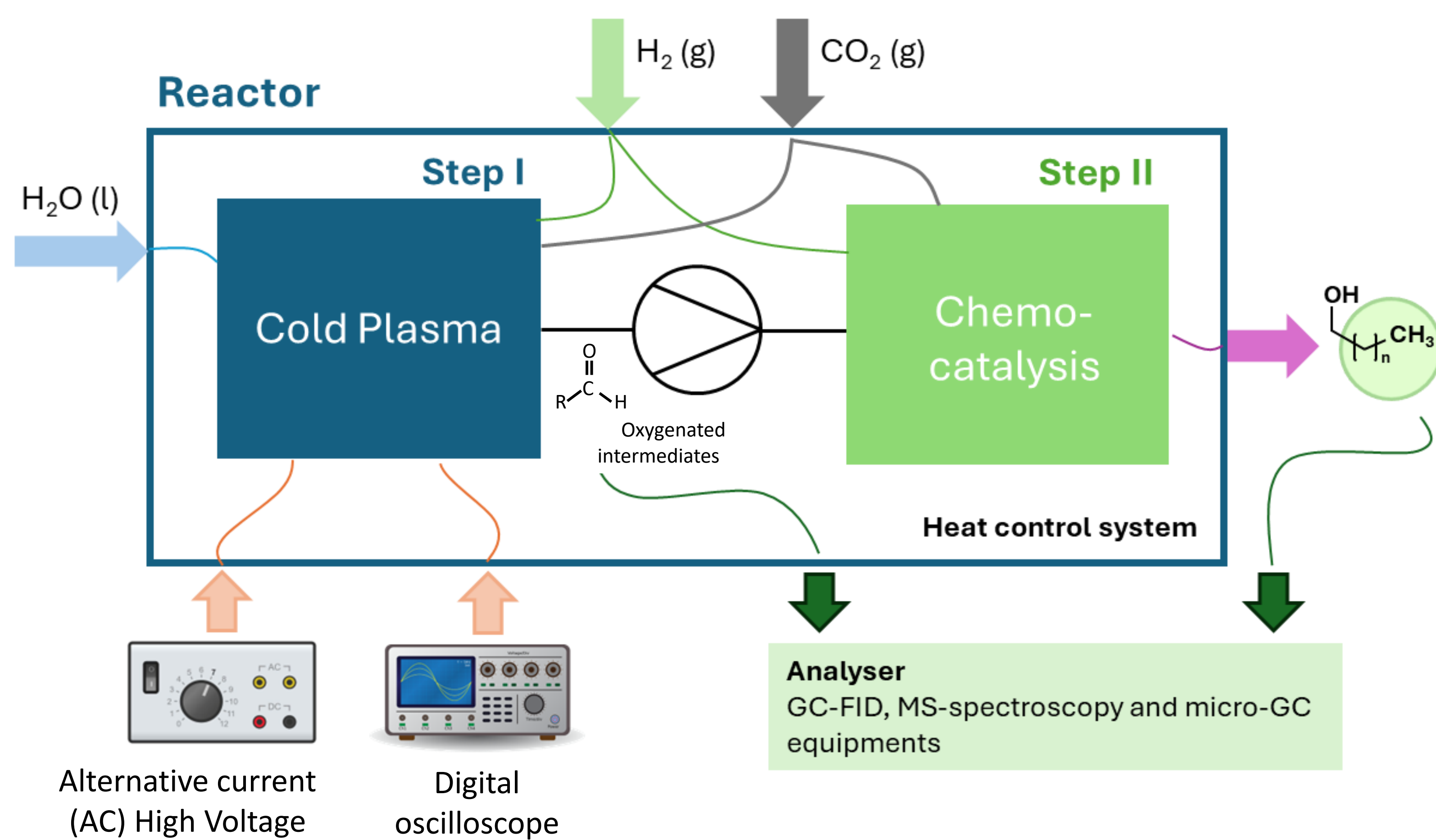
These works aim to develop and validate a modular cascade technology for CO₂ conversion into synthetic fuels, **integrating catalytic and plasma-assisted processes** under mild conditions.

+C2FUE-LS APPROACH



Experimental methodology and system design

PRELIMINARY TEST BENCH DESIGN

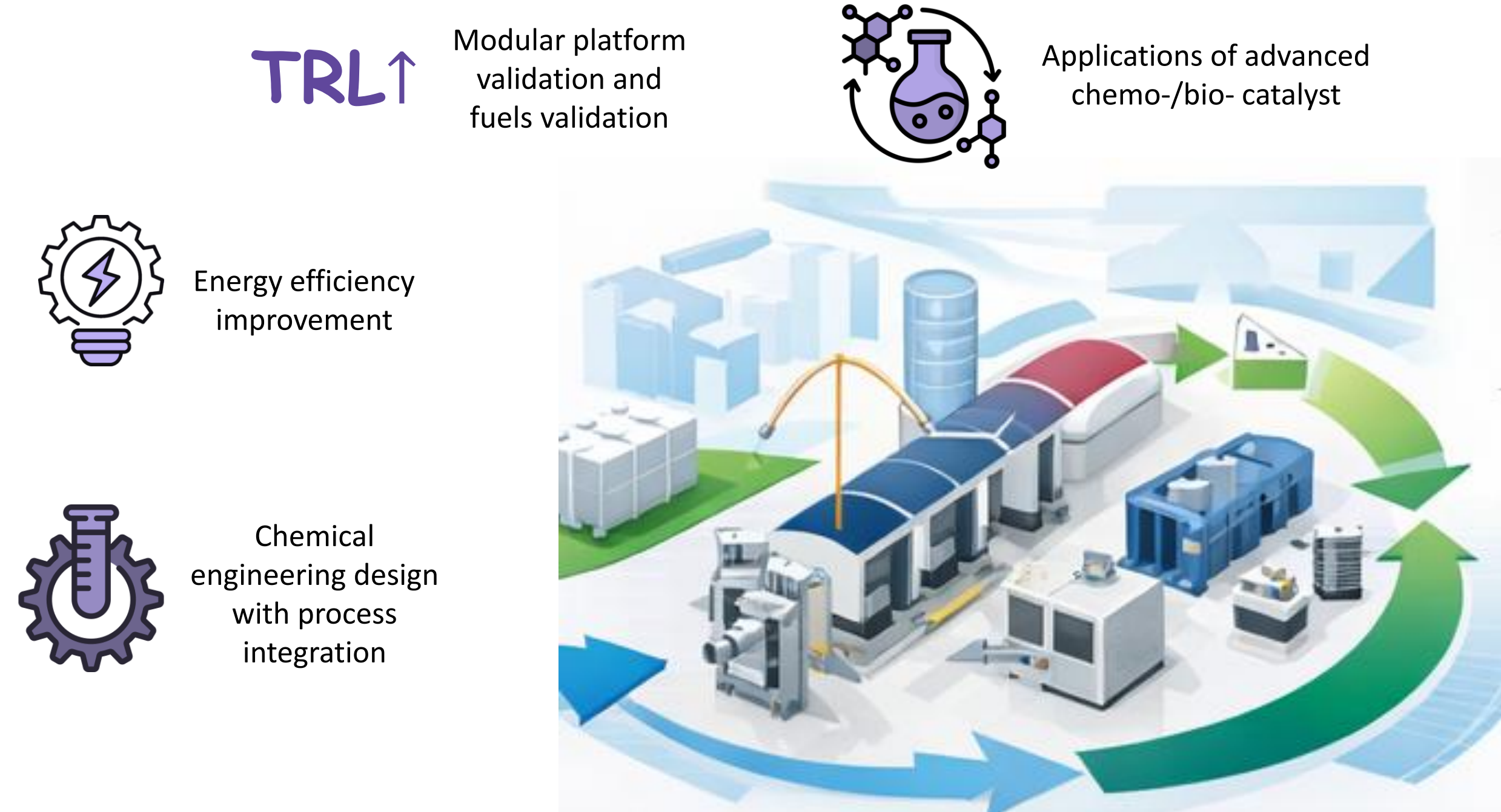


STATE OF THE ART FOR CO₂ CONVERSION

CO ₂ to oxygenated compounds	Thermochemistry	CO ₂ to light alcohols	Thermochemistry
Temperature (°C)	30-260	Temperature (°C)	25-330
Pressure (bar)	10-50	Pressure (bar)	1-20
Conversion (%)	14 - 90 %	Conversion (%)	14 - 90 %

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Kanuri, S., (2022). *International Journal of Energy Research*, 46(5), 5503-5522.



Expected results

- Validation of CO₂ conversion with high selectivity towards products of interest.
- Identification of critical operating conditions (T, P, flow rate, residence time) to achieve optimal conversion, selectivity, and product yield.
- Creation of an 'operational toolbox' that defines operating windows and design limitations, serving as a basis for further industrial developments.
- Validation of the produced synthetic fuels in fuel cells, demonstrating compatibility with practical applications.

Remarks

The +C2FUE-LS project represents a groundbreaking strategy for the valorisation of CO₂ into synthetic fuels with high energy efficiency. By integrating catalytic, plasma-assisted and process engineering solutions supported by advanced instrumentation and integration expertise.

Acknowledgement

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency. Neither the European Union nor the granting authority can be held responsible for them. Financial support from the T13-23R (the Aragon Government) is also gratefully acknowledged.