

Conversion of Energy in Sustainable Chemicals



Timeline | 02/2024 to 01/2026



ICIQ People | [Palomares Research Group](#)



Budget | 360.000 €



Call | CLIMA 2023

SUMMARY

CESC aims to transform CO₂ into compounds of economic interest, tackling two hot issues: The first one is the decarbonization of relevant industrial processes contributing to a safer and healthier environment. The second one is to use CO₂ as a primary source to produce chemicals of economic interest such as CO, CH₄ and other C₂ (i.e., ethylene) products that are currently produced from fossil fuel sources. To achieve the above-mentioned goals, we propose the construction of a continuous flow catalytic reactor with a Technology Readiness Level 4 (TRL4) for the reduction of CO₂ into chemicals of economic interest. The project will comprise: (i) Design and development of novel efficient and stable catalysts for the transformation of CO₂; (ii) Optimization of the solar-to-fuel conversion efficiency using solar cells by the design and fabrication of molecular solar cells that deliver sufficient current and voltage to promote the electrochemical reduction of CO₂; (iii) Development of a pilot continuous flow modular and smart device that integrates CO₂ electrochemical reduction, an organic photovoltaic system as power supply and CO₂ capture systems; and (iv) Data analysis and impact assessment to accelerate early implantation at a pilot plant. Materials science, catalysis and engineering can provide different and an alternative pathway to convert atmospheric CO₂ in other value-added chemical products and, thus, trigger the interest of the chemical industry in the capture and use of CO₂ from the pipeline and re-use it, as a feedstock, to create a circular economic business. To achieve these objectives, a multidisciplinary research teams formed by URV, ICIQ and EUT have joined in CESC to share knowledge and prepare a modular electrochemical reactor at TRL4 integrating in one device the CO₂ capture, the power generation from renewable solar energy and the electrocatalytic conversion of CO₂ towards products of interest.

WP2: Catalyst Development



WP4: Development of MEA and molecular-smart EC reactors: TRL3, and TRL4 integration OPV power sources and CO₂ capture system

WP3: OPV Development



WP5: Life Cycle Assessment, Social Assessment and technoeconomic feasibility/Cost Analysis



CONSORTIA



Project coordinator

