

RESEARCH PORTFOLIO

Microbial Electrosynthesis Technologies

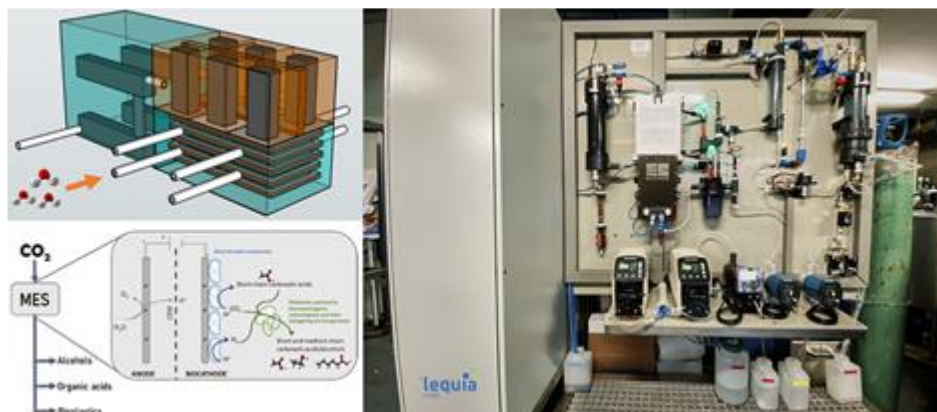
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Name of scientists in charge

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Technology description

- > Microbial electrosynthesis: from CO₂ to valuable products
- > Biogas upgrading (electromethanogenesis)
- > Fermentation for middle chain carboxylic acid production



Research expertise

- > Studies about CO₂ removal/transformation (biogas purification, bioelectrosynthesis of alcohols and volatile fatty acids)
- > Knowledge about BES design and scalability
- > Experience in fermentation biotechnology for middle-chain carboxylic acid production (caproate)
- > Knowledge of electrochemical characterization techniques (LSV, CV, DPV, EIS)
- > Identification of microbial population through molecular techniques (FISH, SEM, PCRs)
- > Design and development of modules to capture CO₂ from indoor air in order to produce a concentrated stream to feed bioprocesses such as bioelectrochemical technologies to produce commodity chemicals

Projects

- > **FUELS-C –An integrated platform of novel cost and energy-efficient conversion technologies producing liquid and gaseous biofuels from sustainable biogenic residues validated for direct use in fuel cells.** European Commission. Call: HORIZON-CL5-2023-D3-02-07. GA: 101147442. 2024-2027.
- > **ALGAESOL – Sustainable aviation and shipping fuels from microalgae and direct solar BES technologies.** European Commission. Call: Horizon Europe – HORIZON-CL5-2023-D3-02-08. GA. 101147112. 2024-2027.
- > **PANGEA - Process intensificAtion for bioelectroCO2 recyclinG into carbon-nEutral products.** Spanish Ministry of Innovation and Science. Call: Proyectos de Generación del Conocimiento 2021. Ref. PID2021-1262400B-I00. 2022-2025.
- > **De-Cent - Portable bioelectrochemical modules for decentralised mitigation of CO2 emissions using surplus energy.** Spanish Ministry of Innovation and Science. Call: TED2021. Ref. PLEC2021-007802. 2022-2024.
- > **GAIA: Bioelectroconversion of orGanic waste streams and CO2 into sustaInAble fuels.** Spanish Ministry of Innovation and Science. Call: Lineas Estratégica 2021. Ref. PLEC2021-007802. 2021-2023.

Publications

- > Romans-Casas M., Perona-Vico E., Dessì P., Bañeras L., Balaguer M.D., Puig S. (2023), **Boosting ethanol production rates from carbon dioxide in MES cells under optimal olventogenic conditions**, *Science of the Total Environment* (2023), 85615, 159124.
- > Dessì, P., Buenaño-Vargas, C., Martínez-Sosa, S., Mills, S., Trego, A., Ijaz, U.Z., Pant, D., Puig, S., O’Flaherty, V., Farràs, P. (2023), **Microbial electrosynthesis of acetate from CO2 in three-chamber cells with gas diffusion biocathode under moderate saline conditions**, *Environmental Science and Ecotechnology*, 16, 100261.
- > Rovira-Alsina, L., Romans-Casas, M., Balaguer, M. D., Puig, S. (2022), **Thermodynamic approach to foresee experimental CO₂ reduction to organic compounds**, *Bioresource Technology*, 354, 127181.
- > Blasco-Gómez R., Romans-Casas M., Bolognesi S., Perona-Vico E., Colprim J., Bañeras L., Balaguer M.D., Puig S. (2021), **Steering bio-electro recycling of carbon dioxide towards target compounds through novel inoculation and feeding strategies**, *Journal of Environmental Chemical Engineering*, 9, 4, 105549.
- > Rovira-Alsina L., Balaguer M.D., Puig S. (2021), **Thermophilic bio-electro carbon dioxide recycling harnessing renewable energy surplus**, *Bioresource Technology*, 321, 124423.
- > Dessì P., Rovira-Alsina L., Sánchez C., Dinesh G.K., Tong W., Chatterjee P., Tedesco M., Farràs P., Hamelers H.M.V., Puig S. (2021), **Microbial electrosynthesis: towards sustainable biorefineries for production of green chemicals from CO₂ emissions**, *Biotechnology Advances*, 46, 107675.
- > Vassilev, I., Dessì, P., Puig, S. and Kokko, M. (2022). **Cathodic biofilms – A prerequisite for microbial electrosynthesis**, *Bioresource Technology*, , 348, 126788.
- > Paquete, C., Rosenbaum, M., Bañeras, Ll., Rotaru, A. and Puig, S. (2022). **Let’s chat: communication between electroactive microorganisms**. *Bioresource Technology*, 347, 126705.
- > Bolognesi, S., Bañeras, Ll., Perona-Vico, E., Capodaglio, A.G., Balaguer, M.D. and Puig, S. (2022). **Carbon dioxide to bio-oil in a bioelectrochemical system-assisted microalgae biorefinery process**. *Sustainable Energy & Fuels*, 6(1), 150-161.
- > Rovira-Alsina L., Perona-Vico E., Bañeras L., Colprim J., Balaguer M.D., Puig S. (2020), **Thermophilic bio-electro CO₂ recycling into organic compounds**, *Green Chemistry*, 22, 9, 2947 – 29557.