RESEARCH PORTFOLIO

Electro-bioremediation

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Name of scientists in charge

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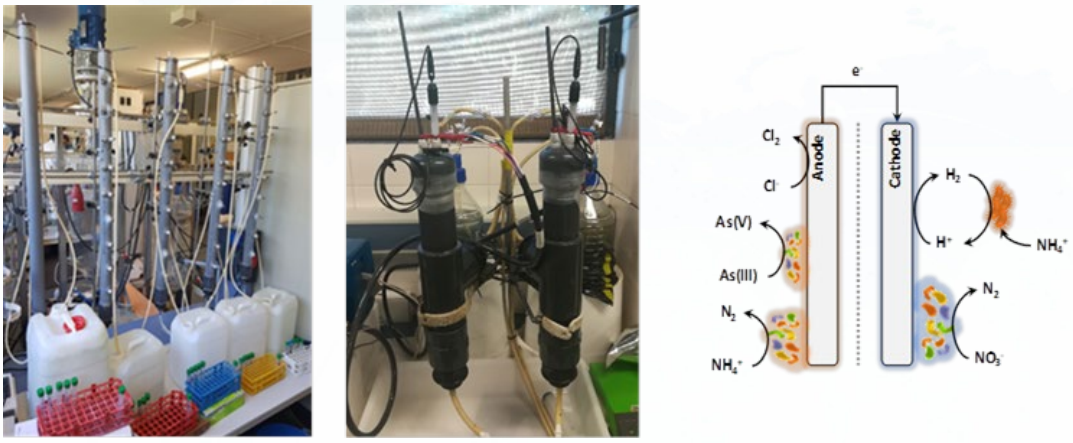
Technology description

> Electro-bioremediation of contaminated waters.
> Ammonium accumulation into microbial protein
> Microplastics electro-biodegradation



Left and centre: Systems for nitrogen removal. Right: Schematics of the main bio-electrochemical reactions studied.

Research expertise

> Studies on bioremediation of groundwater polluted with inorganic nitrogen, arsenic and sulphur compounds.
> Studies on electrochemical softening and electrochemical production of chlorine.
> Studies on electricity-driven ammonium removal.
> Studies on accumulation of ammonium in microbial protein
> Electro bioremediation of microplastics
> Knowledge about the operational parameters to maximize the treatment capacity.
> Knowledge about BES design and scalability.
> Electrochemical characterization of electroactive biofilms.

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Projects

DEPURHOB- Development of an integrated system PPB/HOB for the valorization of digestates, carbon dioxide and the production of sustainable fertilizers. Catalan Ministry of Agriculture, Livestock, Fisheries and Food. Call: Ajuts a les activitats de demostració de coneixement 2023-2027. Ref: ACC_2023_EXP_SIA002_20_0000005. 2024-2026.

NYMPHE – New system-driven bioremediation of polluted habitats and environment. European Commission. Call: HORIZON-CL6-2021-ZEROPOLLUTION-01-10. GA: 101060625. 2023-2024.

ELECTRA – Electricity driven Low Energy and Chemical input Technology foR Accelerated bioremediation. European Commission. Call: H2020-NMBP-CE-BIOTEC-04-2018. GA: 826244. 2019-2023.

Publications

Rovira-Alsina, L., Pous, N., Zhang, Y., Balaguer, M. D., Perona-Vico, E., Bañeras, L., Puig, S., **Empowering microbial proteins: Continuous electro-fermentation of hydrogen-oxidizing bacteria from water, urea and carbon dioxide**, *Chemical Engineering Journal (2025),* 526, 171375.

Rovira-Alsina, L., Pous, N., Balaguer, M. D., Matassa, S., Zhang, Y., Puig, S. **Power-to-Protein: Electro-cultivation of microbial proteins from recycled nitrogen and carbon dioxide.** *Journal of Power Sources (2025)*, 638, 236499.

Ceballos-Escalera, A., Pous, N., Bañeras, Ll., Balaguer, M.D. and S. Puig. **Advancing towards electro-bioremediation scaling-up: on-site pilot plant for successful nitrate-contaminated groundwater treatment**. *Water Research (2024)*, 256, 121618.

Botti, A., Pous, N., Cheng, H.Y., Colprim, J., Zanaroli, G. and Puig, S. **Electrifying secondary settlers to enhance nitrogen and pathogens removals**. *Chemical Engineering Journal (2023)*, 451(3), 138949.

Pous N., Bañeras, L., Corvini, P. F. X., Liu, S.J., Puig, S. **Direct ammonium oxidation to nitrogen gas (Dirammox) in Alcaligenes strain HO-1: The electrode role**, *Environmental Science and Ecotechnology (2023),* 15, 100253.

Pous N., Balaguer, M.D., Matassa, S., Chiluiza-Ramos P., Bañeras L., Puig S., **Electro-cultivation of hydrogen-oxidizing bacteria to accumulate ammonium and carbon dioxide into protein-rich biomass,** *Bioresource Technology Reports (2022),* 18, 101010.

Ceballos-Escalera A., Pous N., Chiluiza-Ramos P., Korth B., Harnisch F., Bañeras L., Balaguer M.D., Puig S., **Electro-bioremediation of nitrate and arsenite polluted groundwater,** *Water Research (2021)*, 19015, 116748.

Pous N., Korth B., Osset-Álvarez M., Balaguer M.D., Harnisch F., Puig S., **Electrifying biotrickling filters for the treatment of aquaponics wastewater,** *Bioresource Technology (2021)*, 319, 124221.

>Ceballos-Escalera, A., Pous, N., Balaguer, M.D., Puig, S., **Electrochemical water softening as pretreatment for nitrate electro bioremediation**. *Science of the Total Environment (2022)*, 806, 150433.

Osset-Álvarez, M., Pous, N., Chiluiza-Ramos, P., Bañeras, L., Balaguer, M.D., Puig, S. **Unveiling microbial electricity driven anoxic ammonium removal**. *Bioresource Technology Reports (2022)*, 17, 100975.

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