RESEARCH PORTFOLIO

Membrane technologies for water treatment and resource recovery

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Name of scientists in charge

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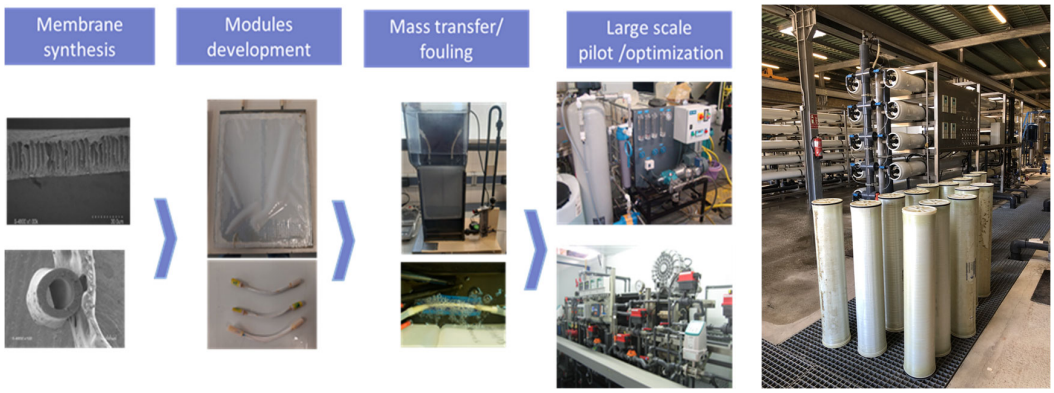
Technology description

Basic/applied research for a better understanding of membrane-based processes and their application for wastewater treatment/reuse and desalination. Improvement of design, operation and control of membranes.



Research expertise

Expertise:

> Membrane fouling and clogging: from basic research of the responsible parameters to practical aspects for cleaning and monitoring.
> Membrane and modules fabrication
> Membrane characterization (bench scale filtration tests, physical characterization).
> Modelling and simulation.
> Fate of micropollutants.
> Development and validation of decision support systems for membrane processes control.

Membrane technologies:

> Membrane bioreactors (MBR): for wastewater treatment /grey water treatment and reuse, and integrated systems (with NF/RO)
> Coupling of membrane technologies with biological reactors (fermenter, photobioreactor, BES systems)
> Pressure driven system for separation and concentration of nutrients (MF, UF, NF, RO)
> Forward osmosis: as concentration and purification steps for water reuse and desalination (from bench scale to pilot scale, cross flow and submerged systems)
> Membre distillation and electrodialysis setups for water and nutrients recovery
> Recycling of RO membranes for water treatment and validation in full-scale.
> Decentralized membrane purification systems for remote area and emergencies.
> Membrane technology for water reuse and drinking water production.

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Projects

> **MORIARTY** - Bridging the Water Gap: A Step Forward in Multifaceted Risk Evaluation in Supply Scenarios with Regenerated Water. Spanish Research Agency AEI. Call: Generación de Conocimiento. Ref: PID2024-155733OB-I00. 2025-2028.

> **CONCENTRA -** New membrane concentration systems within high VOC concentration ranges to produce PHAs Giving four lives to osmotic membranes with innovative recycling processes. Catalan Agency ACCIÓ. Call: Nuclis R+D. Ref: ACE053/22/000081. 2022-2025.

> **OSMO4LIVES -** Giving four lives to osmotic membranes with innovative recycling processes. Spanish Research Agency AEI. Call: Proyectos de Generación de Conocimiento. Ref: ACE053/22/000081. 2022-2025.

> **MEMBRANET**- Spanish investigation network in membrane sciences and technologies for water treatment. Spanish Research Agency AEI. Call: Redes de Investigación. Ref RED2024-153562-T. 2025-2027.

Publications

Zappulla-Sabio, B.; Le-Clech, P.; Dumée, L.F.; Balakrishnan, H.K.; Monclús, H.; Blandin, G. **The Hidden Challenge of Membrane Recycling: How Drying Affects Membrane Layers**? *Journal of Water Process Engineering (2025)*, 76, 108110.

Zappulla-Sabio, B.; Jaurrieta, L.; Gernjak, W.; Balakrishnan, H.; Dumée, L.F.; Monclús, H.; Blandin, G. **Membrane Recycling: Exploring Ozone as a Viable Alternative to Chlorine for Polymeric Membrane Transformation**. *ACS EST Eng. (2025)*, 5, 11.

Yalamanchili, R.; Cegarra, P.O.; Galizia, A.; Rodriguez-Roda, I.; Blandin, G. **Single-Pass Forward Osmosis for Efficient Feed Concentration: Optimizing Multiple Modules Arrangement and Flow Distribution**. *Desalination (2025)*, 615, 119224.

Olives, P.; Ramos, C.; Rodrigez-Roda, I.; Margarit, J.; Carbonell, S.; Blandin, G. **Simultaneous High Volatile Fatty Acids Concentration and Ethanol Extraction Using Nanofiltration, Reverse Osmosis and Forward Osmosis**. *Process Safety and Environmental Protection (2025)*, 197, 106954.

Galizia, A.; Comas, J.; Rodríguez-Roda, I.; Blandin, G.; Monclús, H. **Integration of Specific Aeration Demand (SAD) into Flux-Step Test for Submerged Membrane Bioreactor**. *Membranes* (2025), 15, 111.

Demiral, Y.O.; Ayol, A.; Blandin, G.; Yalamanchili, R. **Applicability of Forward Osmosis Pre-Concentration Process for Resource Recovery from Municipal Wastewater: Opportunities, Challenges and Current Advancements**. *Journal of Water Process Engineering (2025)*, 74, 107853.

Sabio, B. Z.; Pacheco, R. G.; Pàrraga, P. V.; Bernades, I. A.; Sales, H. M.; Blandin, G. **Gravity-Driven Ultrafiltration and Nanofiltration Recycled Membranes for Tertiary Treatment of Urban Wastewater**, *Journal of Water Process Engineering (2024)*, 63, 105545.

Yalamanchili, R.; Rodriguez-Roda, I.; Galizia, A.; Blandin, G. **Can a Forward Osmosis-Reverse Osmosis Hybrid System Achieve 90 % Wastewater Recovery and Desalination Energy below 1 kWh/M³? A Design and Simulation Study**. *Desalination (2024)*, 585, 117767.

Galizia, A., Comas, J., Pino, A., Rodero, A., Rodríguez-Roda, I., Blandin, G., Monclús, H., **Optimizing full-scale MBR performance: A dual-phase approach for real-time air-scouring and permeate flow modifications**, *Journal of Water Process Engineering (2024)*, 66, 105992.

Olives, P.; Sanchez, L.; Lesage, G.; Héran, M.; Rodriguez-Roda, I.; **Impact of Integration of FO Membranes into a Granular Biomass AnMBR for Water Reuse**, *Membranes (2023)*, 13, 3, 265.

Spinoff

Ecomemb is a spinoff company of University of Girona and the Catalan Institute for Water Research founded in 2022 that collects discarded filters from large seawater desalination plants, treats them, and sells them to other types of smaller facilities, which treat water for irrigation and industrial processes, among others. UdG and ICRA were awarded with 2024 National Research Prize by Catalan Research Foundation for the foundation of Ecomemb.

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