

SCIENTIFIC PORTFOLIO

Autotrophic nitrogen removal from high loaded wastewaters

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Name of scientists in charge

- > **Dr Jesús Colprim**, Associate Professor. J.Colprim@lequia.udg.cat
- > **Dr Marilós Balaguer**, Full Professor. marilos@lequia.udg.cat
- > **Dr Maël Rusalleda**, Post-doctoral researcher. mael@lequia.udg.cat

Technology description

- > Autotrophic nitrogen removal from industrial ammonium rich wastewater.
- > Improvement of N-removal efficiency in existing facilities.
- > Reduction of treatment costs (low aeration, carbon source dosage avoided, removal of alkalinity and bCOD)



Overview of the PANAMMOX technology: scheme of the process and leachate treatment plants

Research expertise

- > Development of the PANAMMOX® process for autotrophic N removal.
- > Expertise on conditioning of high N strength wastewater with highly variable characteristics previous to anammox reactors. Knowledge about start-up and long term operation of PN-SBR. Knowledge about denitrification via nitrite.
- > Expertise on process design, configuration and operation for industrial wastewater treatment (leachate, sludge digestion returns, manure). Scalability. Studies on process automation. Either 2-step or 1-step PN/anammox configuration.
- > Studies on wastewater with extreme conditions of ammonium content, conductivity, COD (both refractory and biodegradable) and complex matrix.
- > Studies on development of advanced wastewater treatment solutions by combining PN/anammox with other technologies (such as AOPs).
- > Studies on mechanisms and quantifications of nitrous oxide (N₂O). Identification of microbial populations through molecular techniques (FISH, PCR/qPCRs).

Most relevant projects

- > **TreatREC** - Interdisciplinary concepts for municipal wastewater treatment and resource recovery. Tackling future challenges. European Commission. H2020 - MSCA - ITN – 2014. GA: 642904. 2015-2018.
- > **N-OPTIMOX**: First demonstration plant of the PANAMMOX® technology applied to the treatment of leachates. Spanish Ministry of Science and Innovation. INNFACTO. IPT-2011-1073-310000. 2011-2014.
- > **NIMOX**: Partial nitrification and anaerobic oxidation of ammonium by anammox biomass from anaerobic digestion effluents of urban WWTP. Spanish Ministry of Education and Science. DEX-560620-2008-149. 2008-2010.

Most relevant publications

- > Rusalleda, M., Seredynska-Sobecka, B., Ni, B.-J., Arvin, E., Balaguer, M.D., Colprim, J., Smets, B. F. (2014) **Spectrometric characterization of the effluent dissolved organic matter from an anammox reactor shows correlation between the EEM signature and anammox growth**, *Chemosphere*, 117, 271-277.
- > Gabarró, J.; González-Cárcamo, P.; Rusalleda, M.; Ganigué, R.; Gich, F.; Balaguer, M.D.; Colprim, J. (2014). **Anoxic phases are the main N₂O contributor in partial nitrification reactors treating high nitrogen loads with alternate aeration**. *Bioresource Technology*, *in press*.
- > Gabarró, J., Hernández-del Amo, E., Gich, F., Rusalleda, M., Balaguer, M.D., Colprim, J. (2013). **Nitrous oxide reduction genetic potential from the microbial community of an intermittently aerated partial nitrification SBR treating mature landfill leachate**. *Water Research* **47** (19), 7066 – 7077.
- > Anfruns, A., Gabarró, J., Gonzalez-Olmos, R., Puig, S., Balaguer, M.D., Colprim, J. (2013). **Coupling anammox and advanced oxidation-based technologies for mature landfill leachate treatment**. *Journal of Hazardous Materials* **258-259**, 27 – 34.
- > Gabarró, J.; Ganigué, R.; Gich, F.; Rusalleda, M.; Balaguer, M.D.; Colprim, J. (2012). **Effect of temperature on AOB activity of a partial nitrification SBR treating landfill leachate with extremely high nitrogen concentration**. *Bioresource Technology*, **126**, 283 - 289.
- > Scaglione, D.; Rusalleda, M.; Ficara, E.; Balaguer, M.D.; Colprim, J. (2012). **Nitrite inhibition and recovery response of anammox granular biomass adapted to mineral medium and landfill leachate**. *Chemical Engineering Journal*, **209**, 62-68. (13), 414-419.