RESEARCH PORTFOLIO

Phosphorus precipitation and recovery form wastewater and organic liquid streams

April 2026

Name of scientists in charge

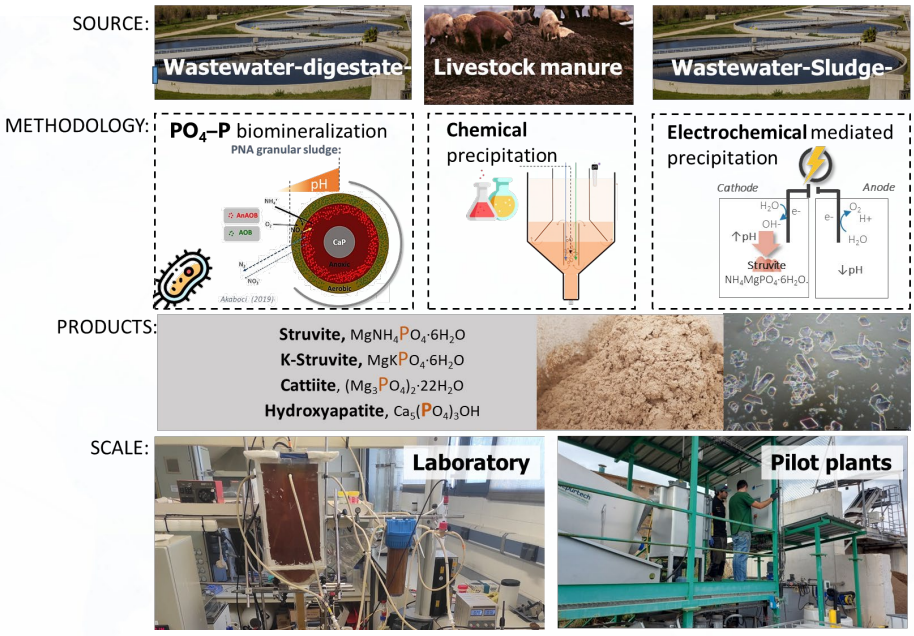
> **Dr Jesús Colprim**, Full Professor – jesus.colprim@udg.edu
> **Dr Maria Dolors Balaguer**, Full Professor – dolors.balaguer@udg.edu
> **Dr Alba Ceballos-Escalera**, Senior post-doctoral researcher – alba.ceballosescalera@udg.edu

Technology description

>Nutrient recovery: recovery of nitrogen, phosphorus, and potassium from wastewater and other organic streams.

> High-value products: targeted production of magnesium phosphates (MAP – struvite, MPP – K-struvite) and calcium phosphatesfor use as agricultural fertilizers and chemical industry raw materials, supporting circular economy principles and reducing reliance on mined resources.

>Process development: advanced crystallization, precipitation, and separation techniques for efficient nutrient recovery.



Overview of nutrient recovery alternatives, including sources, methodologies, recovered products, and scale.

Research expertise

> Phosphorus recovery from wastewater treatment plants (digestate, sludge, centrate) and other sources, such as livestock manure, alongside magnesium, nitrogen, and potassium. Expertise in nutrient recovery as mineral products, including struvite, K-struvite, cattiite, and apatite.
> Expertise in various precipitation methods, including bio-induced (anammox-based), electrochemical, and chemical approaches.

INSTITUTE OF THE ENVIRONMENT
Universitat de Girona – Campus Montilivi s/n – 17003 Girona – Catalonia, Spain
Tel. +34 972 419 859 – Fax +34 972 418 150 – info.lequia@udg.edu – www.lequia-udg.com

>Process development, including design, configuration, automation, and modeling of nutrient recovery strategies, with a focus on scalable technologies.
>Experience in operational optimization, targeting the quality of the recovered product (composition and particle size) and the treated liquid source.
>Experience with complex wastewater matrices with variable nutrient content (P, N, K, Mg, Ca), COD, and conductivity, including the development of pretreatment strategies and evaluation of alternative magnesium sources.
>Product characterization using advanced analytical and microscopy techniques to study the composition and crystal size of recovered products, including XRD, ICP-MS, ICP-OES, and SEM-EDX.

Projects

SPORE-MED – Sustainable upgraded WWTPs for resource recovery, water reuse and health surveillance in the Mediterranean region. PRIMA-Section1-Call 2023-Topic 1.1.1. GA: 2322. 2024-2027. Role: coordinating entity.

K-EcoFeRtilizer – Development of a new process for the recovery of potassium struvite usable as fertiliser applied to the treatment of pig slurry. Granges Terragrisa S.L. DARP, Projectes Pilots de Grups Operatius 2019. 56.21.024.2019 5C. 2020-2022. Role: subcontracting entity.

Publications

Magrí, A., Company, E., Farrès, M., Ferrer, J., González, E., Domingo, F., & Colprim, J. (2024). **Recovery of potassium-rich struvite in a pig farm downstream a nitrogen removal treatment plant: Technological, agricultural and economic assessment.** *Waste and Biomass Valorization*, *16*, 2327–2337.

Dessì, E., Company, E., Pous, N., Milia, S., Colprim, J., Magrí, A. (2024), **Reagent-free phosphorus precipitation from a denitrified swine effluent in a batch electrochemical system**, *Heliyon*, 10, 17, 2024, e36766.

Mendoza, E., Magrí, A., Blandin, G., Bayo, A., Vosse, J., Buttiglieri, G., Colprim, J. and Comas, J. (2023), **Second-Generation Magnesium Phosphates as Water Extractant Agents in Forward Osmosis and Subsequent Use in Hydroponics**, *Membranes*, 13(2), 226.

Company, E.; Farrés, M.; Colprim, J.; Magrí, A. (2022). **Exploring the recovery of potassium-rich struvite after a nitrification-denitrification process in pig slurry treatment.** *Science of the Total Environment.* 84715, 157574.

Magrí A., Company E., Gich F., Colprim J. (2021). **Hydroxyapatite formation in a single-stage anammox-based batch treatment system: reactor performance, phosphorus recovery, and microbial community.** *ACS Sustainable Chemistry and Engineering* 9(7), 2745-2761.

Magrí A., Carreras-Sempere M., Biel C., Colprim J. (2020). **Recovery of phosphorus from waste water profiting from biological nitrogen treatment: Upstream, concomitant or downstream precipitation alternatives.** *Agronomy* 10(7), 1039.

Johansson S., Ruscalleda M., Saerens B., Colprim J. (2018). **Potassium recovery from centrate: taking advantage of autotrophic nitrogen removal for multi-nutrient recovery.** *Journal of Chemical Technology and Biotechnology* 94(3), 819-828.

Tarragó E., Sciarria T.P., Ruscalleda M., Colprim J., Balaguer M.D., Adani F. Puig, S. (2018). **Effect of suspended solids and its role on struvite formation from digested manure.** *Journal of Chemical Technology and Biotechnology* 93(9), 2758-2765.

Johansson S., Ruscalleda M., Colprim J. (2017). **Phosphorus recovery through biologically induced precipitation by partial nitritation-anammox granular biomass.** *Chemical Engineering Journal* 327, 881-888.

INSTITUTE OF THE ENVIRONMENT
Universitat de Girona – Campus Montilivi s/n – 17003 Girona – Catalonia, Spain
Tel. +34 972 419 859 – Fax +34 972 418 150 – info.lequia@udg.edu – www.lequia-udg.com