

1. Line of research and training capacity

The present job offer is a training PhD contract (former FPI). The doctoral candidate will join the PhD program 'Industrial and environmental science and technology' at UPO University. OLISWINE brings an excellent and highly specialized platform to go beyond a doctoral programme. The scientific training plan for the doctoral candidate foreseen in OLISWINE is justified by the same objective of the proposal, acquiring training on operation of anaerobic reactors, advanced analytical tools and analytical methods, i.e. GC, ICP-MS, HPLC, HPLC-MS-MS, QPCR and PCR. Analytical methods with high demand in leading companies and research centres.

Training on the determination of metals, phenols, pharmaceutical residues and antibiotic resistance genes together with environmental engineering tasks such as anaerobic digester optimization will give to the doctoral candidate a high level of multi-disciplinary expertise.

Furthermore, the research team is working on several state and international projects in direct connection with the productive sector, which guarantees a more complete and competitive learning and substantial support for the professional future of the doctoral candidate.

The following specific training activities are planned:

- **Assist in supervision** of bachelor's and master's degree. **Human resource management** will be trained by these activities.
- **Short stays** with other members of the research and work teams (Dr. Pintado). Besides specific training in different techniques, these short stays will train the doctoral candidate on **how to work in different laboratories**.
- **Internship: It is proposed that the PhD student will carry out a stay in Norway** with Dr. Jael-Gil. The internship in an international centre is offering to the PhD candidate a perfect occasion to **expand his/her network at international level**.
 - PhD candidate will participate in **various training courses** related with Molecular biology, HPLC, Statistics and ICP techniques, etc.
- **Presentation of results** to national and international congresses. This will train the doctoral candidate in **scientific dissemination**.
- Carry out various outreach activities focused on **publicizing the outcome of the project to society**. This will train the doctoral candidate in **scientific communication**.

2. Previous results of the team in the theme of the proposal.

The team members have a strong project-related experience on the topic: anaerobic digestion for hydrogen and methane production including toxic compounds in biogas, environmental biotechnology, molecular biology and bioremediation of metals and micropollutants, as well as life cycle assessments.

PI Dr. Zahedi, which recently joined the IG-CSIC as a Tenured Scientist have an extensive experience in anaerobic digestion of wastewaters, agroindustry and urban solid wastes for green hydrogen and biomethane production (Zahedi et al., 2022a, 2022b, 2016a, 2016b). She is leading a recent project on the topic (202270I040_CSIC project) which explores the removal of micropollutants and antibiotic resistance genes from SM. During her previous position at the Catalan water research institute, she carried out several studies to evaluate the potential of batch anaerobic digestion for biomethane production and removal of veterinary drugs and antibiotic resistance genes in urban wastewaters (Zahedi et al., 2021b) slaughterhouse wastewater, chicken, cattle and SM (Zahedi et al., 2022a, 2022b, 2021a) and she has also participated in different projects and studies on removal of pathogens, micropollutants in municipal wastewaters

and municipal sludge. Her research also includes the identification of microbial groups employing different microbiological techniques such as fluorescence in situ hybridization and partial sequencing of the 16S rRNA genes.

The PI Fermoso has been working with Alpejujo valorization since 2015 focusing in methane production (Serrano et al., 2019), polyphenols as possible inhibitors (Caroca et al., 2021) and as added value products, VFA production (Cabrera et al., 2019) or its techno-economic and environmental assessment (Alonso-Fariñas et al., 2020). Codigestion with SM is offering a new opportunity which brings fascinating challenges such as micropollutants and antimicrobial resistance genes removal or green hydrogen production. The expertise brought by the IP, Dra. Zahedi to IG-CSIC, makes an ideal situation to study and develop the OLISWINE proposal together with Dr. Fermoso.




The interdisciplinary research team will reinforce the expertise in key areas of the project, such as the head of the Analysis Unit at the IG-CSIC (Dr. Rosa Cert), where a wide range of food and by-products analyses are carried out, such as metals and contaminants and MSc. Jose Manuel Espinosa with a broad background in molecular biology.


This project will benefit from the support of Dr. M. Pintado, member of the Regulated and Emerging Contaminants in the Environment group in Cadiz University, and by the Dr. Adrian Jael, Research Scientist at NORCE Norwegian Research Center, leaders in the detection and quantification of priority and emerging contaminants.

3. Human, material and equipment resources available for the execution of the Project.

Table 1 summarize the Research team for the OLISWINE.

Table 1. Principal Investigator [PI], Research Team member [RT]

<p>Dr. Soraya Zahedi (SZ) [PI]</p> 	<p>Dr. Soraya Zahedi is a Tenured Scientist at IG-CSIC from 2021. Experience on anaerobic digestion for hydrogen and methane production from different agro-industrial and municipal wastes. Her research also including, the identification of microbial groups employing different microbiological techniques such as FISH, PCR and qPCR, the evaluation and the degradation of micropollutants as PhACs, ARGs and pathogens in different by-products. https://orcid.org/0000-0002-0347-3546</p>
<p>Dr. Fernando G. Fermoso (FF) [PI]</p> 	<p>Dr. Fernando G. Fermoso is a Tenured Scientist at IG-CSIC from 2012. Leader of the Bioprocesses for the Circular Economy group (BIOCE), belonging to the Department of Food Biotechnology. He has broad expertise in biotechnologies for energy production (from wastewaters, solid waste and energy crops) and aerobic and anaerobic wastewater technologies. https://orcid.org/0000-0002-2586-007X</p>
<p>Dr. Rosa Cert (RC) [RT]</p> 	<p>Dr. Rosa Certs counts with more than 10 years working as Manager in the Analysis Unit at the IG-CSIC. She has dedicated herself to the analysis of the fats and foods by standardized and/or official methods, as well as to the development of internal methods in very diverse matrices. Specialist in Quality and Purity of edible oils and the analysis of contaminants such as the different families of hydrocarbons (saturated aliphatic hydrocarbons, polycyclic aromatic hydrocarbons, etc.), antioxidants and metals. https://orcid.org/0000-0003-3972-6522</p>

<p>MSc. Jose Manuel Espinosa [RT]</p> 	<p>MSc. Jose Manuel Espinosa has a broad expertise in molecular biology. His research includes gene regulation in plants under hydric stress; and <i>Drosophila melanogaster</i>, used as model organism for disentangle gene networks involved in development. He also works on DNA extractions from different agri-food by-products and anaerobic digestates for analysis of microbial populations (bacteria and methanogens) for subsequent amplification of the 16s rDNA using Illumina MiSeq platform and has experience in the analysis of several pathogens.</p> <p>https://orcid.org/0000-0003-2470-2245</p>
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4. Training capacity of the research team (last 10 years)

In the last 10 years, 11 doctoral theses have been completed or are being developed by the IPs:

F. Ferrari. Combining forward osmosis and anaerobic membrane bioreactor technologies for raw municipal wastewater treatment. Supervisors: M. Pijuan, S. Zahedi & I. Rodriguez. 20/10/2020 (3 Papers).

J. Cubero: Valorización del extrusionado de Fresa Residual: obtención de compuestos de alto valor añadido y digestión anaerobia. UH. Supervisors: Fernando G. Feroso, R. Borja & J. Urbano. 16/12/2021 (12 Papers).

M. Garuti: Improving circular economy by biogas plant: valorization of subproducts from the agri-food sector. UPO. Supervisors: F. G. Feroso & A. Jimenez. 30/11/2022 (4 Papers).

A. Trujillo: Recuperación de energía y nutrientes a partir de residuos de mercados abiertos en la Cuenca Mediterránea. UPO. Supervisors: A. Serrano & F. G. Feroso. 26/01/2023. (12 papers)

P. Hazani: M2ex ITN programm (UPO & National University of Ireland. Galway). Supervisors: F. G. Feroso, A. Serrano & Gavin Collins. End: December 2023.

S. George: M2ex ITN programm (UPO & Universita Degli Studi di Napoli Federico II, Italy). Supervisors: F. G. Feroso, A. Serrano & L. Frunzo. End: 2023.

E. Nicolás Caroca Sepúlveda. M2ex ITN programm (University of Limoges (France) and UPO). Supervisors: G. Gilles, F. G. Feroso & S.Zahedi. End: 2024.

K. Silvera: M2ex ITN programm (UPO & National University of Ireland. Galway). Supervisors: F. G. Feroso, G. Collins & V. O'Flaherty. End: 2024.

A. Maria Florencia Soto: M2ex ITN programm (Universidad Pablo de Olavide & University of Porto, Portugal). Supervisors: Fernando G. Feroso, E. van Hullebusch & M. Almeida. End: 2024.

A. Fathi: M2ex ITN programme (Universidad Pablo de Olavide & Universita Degli Studi di Napoli Federico II, Italy). Supervisors: Fernando G. Feroso, M. Mattei & L. Frunzo. End: 2024.

E. Jiménez. Valorización del alperujo mediante la producción de AGV de gran interés como base de sistemas de biorefinerías. UPO. Supervisors: Fernando G. Feroso & A. Serrano. End: 2025.

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