OVERVIEW

In 2021, one selected candidate will be the beneficiary of a 3-year working contract with all benefits attached. This contract includes **high level interdisciplinary, inter-sectorial, and international training with personalized career development plans involving soft-skills training, secondments and mentoring**. Over 50 partner organisations actively support this programme!

THE MFP-COFUND PROGRAMME OFFERS

- One of the best salaries at PhD level in Europe. Gross monthly salary of approximately 2.200€. Apart from the salary, URV will contribute up to 7.500€ each year to the cost of the fellow's travels, research and training.
- 3-6 months secondments at international (and in some cases intersectoral) partner organisations.
- An international environment, supported by the adherence to the European Charter & Code.
- Enrolment in excellent PhD programmes.
- The opportunity to undertake research in one of the top 150 young universities in the world (THE Young Universities Rankings).
- Access to high-quality infrastructures for research & innovation.
- Gender balanced, Open, Transparent and Merit based Recruitment.
- Equal opportunities for all.

Position description	
Title of the research project	Evaluation of Treatments for the Removal of Microplastics in Urban Wastewater Treatment Plants
Keywords	microplastics, UWWTP, advanced oxidation processes, hydrolysis
Research line	Water treatment and reuse
PhD Programme	Nanoscience, Materials and Chemical Engineering
Reference	2021MFP-COFUND-3

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DESCRIPTION OF THE RESEARCH PROJECT

Microplastics have become recently a major cause of concern due to their widespread distribution, small size, persistence and uncontrolled introduction into the environment. Wastewater treatment plants (WWTPs) are considered one of the major sources of introduction of microplastics into aquatic environments. Microplastics in municipal wastewater treatment plants have their origin in daily life activities, e.g., laundry processes (polyester and polyamide components), personal care (from the use of toothpaste, shower gel…), medicines or consumer plastics.

Microplastics may pose different problems when present in aquatic environments: aggregation onto cell membrane surface after uptaking, adsorption of pollutants and their introduction into organisms, additives in plastics may be transferred to gut tissues… When present in the environment, they suffer the action of different processes (photodegradation, attrition, biodegradation, oxidation), that may induce changes in the morphology, mechanical properties, molecular weight, surface characteristics. This aging process of microplastics can also change their adsorption properties (Liu et al., 2019).

The efficiency on the removal of microplastics in WWTPs depends on the treatment stages applied. According to previous studies (Liu et al., 2021 and references herein) up to 99% of microplastics entering a WWTP could be removed by the combination of pre-treatment, primary, secondary and tertiary treatment. However, they were primarily transferred to the sludge phase; and still, the large volumes of treated water discharged also involve a significant introduction into the environment. Single technologies have been also studied (grit chambers, biological processes, advanced oxidation processes), but results obtained differ significantly between the different studies.

The objective of this research is to study the performance of different technologies (belonging to primary, secondary and tertiary treatments) in the removal of microplastics and understanding the mechanism of action of these technologies on microplastic parts. A special focus will be given to the application of different advanced oxidation processes (Fenton, ozonation and O3/H2O2, UV/H2O2, photocatalysis) as tertiary treatments. Some previous studies on the application of AOPs to the degradation of microplastics have been published (Gomes et al., 2021; Liu et al., 2019; Tofa et al. 2019).

In the framework of an undergoing doctoral thesis, a methodology for the quantification and characterization of microplastics has been developed. The techniques that will be used in the thesis include the removal of organic matter by advanced oxidation-Fenton, and a combination of alkaline and enzymatic hydrolysis. Subsequently, will be applied a density separation and the particles will be classified and identified using a stereoscopic, optical and electron microscope (SEM) combined with spectroscopy techniques (Raman, ATR-FTIR, µFTIR) (Hurley et al., 2018; Lares et al., 2018; Mahon et al., 2018). According to the concentration of total solids in each treatment unit, different methodologies will be applied to obtain an accurate analysis of the Microplastics.

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REQUIRED PROFILE

Highly desirable attributes of the ideal candidate:

- Hold a Master degree, or equivalent, in: Chemical Engineering or related.
- Language skills: Good English level.
- Other skills: interpersonal skills, teamwork, able to work in an international and competitive environment, hardworking, science-driven.

APPLY NOW!

CONTACT DETAILS

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