Marie-Skłodowska-Curie Actions –
Postdoctoral Fellowships 2024

INL Expression of Interest

Research Group Leader /Research Group name:	
Begoña Espiña/ Water Quality	
Scientist in charge:	
Name & surname	Begoña Espiña
Contact email	begona.espina@inl.int

Short description of the research group, including URL if applicable *(Strengths and scientific achievements (publications, patents, etc.), important infrastructure (up to 2000 characters with spaces)):*

Dr. Begoña Espiña founded the Water Quality (WQ) Group at INL in 2016 (https://inl.int/research-groups/water-quality/). Dr. Espiña received 3 awards, had 2 patents granted, established collaborations with >40 research groups from 10 countries, and co-authored 5 book chapters, 80 articles in peer-reviewed international journals, and ca 150 communications in conferences. Dr. Espiña's track record also includes the supervision of 4 PhD students and 14 postdoctoral researchers and participation in 25 national/international projects. Since 2015, she has attracted >5 M€ of competitive funding for more than 20 projects on the development of sensors for environmental monitoring and econanosafety. Dr. Espiña is also a member of several Water Europe working groups and of the Society of Environmental Toxicology And Chemistry (SETAC). At WQ group, we run two research lines with the same moto: *Nanotechnology for a Safe and Sustainable use of Water Resources;* Water monitoring and Econanosafety. Within the ECONANOSAFETY research line, we evaluate nanomaterials' fate, transformation, toxicity and bioaccumulation in aquatic environments. A particular focus is paid to safe and sustainable-by-design approaches in nanomaterials and nano-enabled products. We have a complete set of characterisation equipment for nanomaterials and bio-interactions available. We develop lab-on-a-chip devices that can automate and build more reliable and suitable nanomaterial testing models, including nanoparticle sensors. We have two devoted laboratories; **Zebrafish lab** and **Econanolab,** for zebrafish embryos and microalgae and other aquatic invertebrates, respectively, and extensive knowledge in biological sample preparation and imaging by optical and electron microscopies. Additionally, we have extensive experience in microfluidics' design and fabrication by photolithography + soft lithography, 3D printing, laser cutting and CNC micromilling. At INL, we have excellent micro- and nanofabrication as well as Nanophotonics and electron microscopy and advanced spectroscopies core facilities.

Project title:
Understanding the impact of microalgae-nanoparticle-biotoxin interactions in Harmful Algal Blooms (HABs)
Project description *(up to 2000 characters with spaces):*
Harmful Algal Blooms (HABs) are naturally occurring events that have been increasing in frequency and widespread worldwide as a direct and indirect consequence of human activities, including climate change. These events are caused by an exponential rise on microalgae growth, some of them, producing biotoxins. Nanoparticles (including nanoplastics) have been described to interact with microalgae in water ecosystems and to promote adsorption of biotoxins on their surface. The presence of nanoparticles in the water ecosystems where a HAB occurs can have different effects in microalgae growth, , biotoxin production, sequestering biotoxin on their surface and/or being carriers for them into other organisms consuming microalgae, such as filter feeding mollusks. All those effects may exert dramatic impacts on the risk of HABs for aquatic organisms as well as in human consumption of seafood. We encourage candidates to apply with us for a project proposal which aims to understand the microalgae-nanoparticle-biotoxin interaction, including the effects of their complexes at environmentally relevant concentrations on the microalgae, toxin production, fate, transformation, accumulation and trophic transfer. Some interesting related references: - Zheng X, Zhang L, Jiang C, Li J, Li Y, Liu X, Li C, Wang Z, Zheng N, Fan Z. Acute effects of three surface-modified nanoplastics against Microcystis aeruginosa: Growth, microcystin production, and mechanisms. Sci Total Environ. 2023 Jan 10;855:158906. doi: 10.1016/j.scitotenv.2022.158906. - Zheng X, Yuan Y, Li Y, Liu X, Wang X, Fan Z. Polystyrene nanoplastics affect growth and microcystin production of Microcystis aeruginosa. Environ Sci Pollut Res Int. 2021 Mar;28(11):13394-13403. doi: 10.1007/s11356-020-10388-w - Zhou J, Gao L, Lin Y, Pan B, Li M. Micrometer scale polystyrene plastics of varying concentrations and particle sizes inhibit growth and upregulate microcystin-related gene expression in Microcystis aeruginosa. J Hazard Mater. 2021 Oct 15;420:126591. doi: 10.1016/j.jhazmat.2021.126591

Research fields *(You may choose more than one)*			
Chemistry (CHE)		Life Sciences (LIF)	X
Economic Sciences (ECO)		Mathematics (MAT)	
Environment and Geosciences (ENV)	X	Physics (PHY)	X
Information Science and Engineering (ENG)		Social Sciences and Humanities (SOC)	

Expiration date for Expressions of Interest from postdoctoral fellows:	12th July 2024

Necessary documents to be submitted (in addition to the required CV and motivation letter):
Not applicable