



M2ex – Exploiting metal-microbe applications to expand the circular economy

Marie Skłodowska-Curie Action H2020-MSCA-ITN-EJD-2019

ESR4-UNINA: Mathematical modelling of mobility and bio-physical interaction of TMs in biofilms

Job description

We are looking for a motivated Early Stage Researcher (ESR) in the field of mathematical modelling of mobility and bio-physical interaction of TMs in biofilms. The research fellow will be hosted at the Università degli Studi di Napoli Federico II (UNINA). This group has long expertise in mathematical modelling of biological processes in the context of bioremediation and wastewater treatment including biofilm modelling, leading several projects in this area. He/she will be recruited by UNINA for a period of 36 months with the aim of obtaining a joint PhD degree between UNINA and Université de Limoges (UNILIM).

The M2ex European Joint Doctorate offers to the ESR4 an innovative series of Network-wide training events to ensure a high-quality, engaging and inspirational training environment including secondments in UNILIM (France), Re-Energy Società Cooperativa Sociale (Italy) and ODESSOL (France).

Objectives

Biofilms play a crucial role in the remediation of metal-laden wastewaters. Indeed, sorption of trace and contaminant metals on biofilm components represents to date one of the most promising, effective, and practical approaches for the bioremediation of metals and radionuclides, because of its efficiency, operation simplicity and availability of biomass. However, despite the continuing increases in published research, there has been little or no exploitation in the industrial context. This is probably related to the lack of knowledge on the multiplicity of mechanisms regulating the biosorption process (i.e., ion exchange, adsorption, micro-precipitation, and electrostatic and hydrophobic interactions). Objective of this project is to develop a mathematical model able to describe the TMs transport and interactions within biofilms.

Expected Results

Definition of a new modelling approach taking into account the various mechanisms regulating the TMs fate within biofilm systems. Definition of differential equations governing the adsorption of trace metals on different fractions of the biofilm, such as extracellular polymers, cell membranes and cell walls, dead cells, or inert material, the biofilm dynamics in terms of microbial species growth and substrate consumption/production and transport. Literature review and specific experimental activities during host secondments will provide data for calibration and validation.



Candidate's profile

Requirements of the ideal candidate:

- M.Sc. degree in Mathematics, Applied Mathematics, Engineering, Computer Science, Physics or a related discipline;
- Strong mathematical and computational skills;
- Prior experience in mathematical modelling of biological systems;
- Integrated language, communication and environment skills, especially in an international context.

Our Offer

You will receive an employment contract for 3 years according to the EU contribution for ITN recruitments and general conditions at the host institution. It includes full social security coverage and will start in September 2020. The candidate will also benefit from:

- International collaborations;
- Support to develop new skills;
- Participation in international conferences and workshops;
- Support in application for additional funding and scholarships;
- Creative, innovative and friendly work environment.

Enrolment in Doctoral degree(s): UNINA / UNILIM