

PhD Position in Design of two phase Materials for Bacterial-Based Sustainable Biopesticide Delivery Systems

At ESPCI Paris the Soft Matter Science and Engineering (Cécile Monteux, Théo Merland) and Physics and Mechanics of Heterogeneous Systems (Florence Elias) laboratories will host a collaborative PhD project within the BIOMAC-BP consortium, funded by Marie Skłodowska-Curie Actions Doctoral Networks HORIZON-MSCA-2023. The project will be conducted in close collaboration with Forschungszentrum Jülich (M. Ripoll), in Germany.

Project background

The heavy use of pesticides and fertilizers in agriculture is crucial for the food supply. However, this practice leads to significant environmental and health issues, including poisoning, environmental degradation, and the development of insecticide resistance. EU policies and the UN Sustainable Development Goals advocate for safer, more sustainable alternatives like biopesticides. However, large-scale implementation of these alternatives faces challenges related to formulation and efficacy. The BIOMAC-BP consortium addresses the issue of synthetic pesticide use by developing sustainable biopesticide formulations. Funded by Marie Skłodowska-Curie Actions Doctoral Networks HORIZON-MSCA-2023, the international consortium brings together experts from various scientific fields, including soft-matter physics, physical chemistry, chemical engineering, microbiology, biophysics and agricultural science, and combines industrial and academic perspectives. The project's main objective is to develop and optimize novel bio-sourced formulations suitable for the encapsulation of bacteria capable of producing biopesticides, enhancing their benefits and sustainability. This effort aims to reduce the use of synthetic pesticides, improve agricultural practices, and support a greener future for the agrochemical industry.

Job description

At ESPCI Paris the Soft Matter Science and Engineering (Cécile Monteux, Théo Merland) and the lab of Physics and Mechanics of Heterogeneous Systems (Florence Elias) will host a collaborative PhD whose aim will be to design biocompatible and biodegradable two phase systems containing bacteria, that are aqueous foams and water-in-water emulsions, which are obtained by the phase separation of two polymer solutions [1]). Using such all-aqueous dispersed media should enhance the transfer within them of species which are necessary to the survival of the bacteria such as dioxygen or nutrients (sugars etc). The PhD candidate will cultivate the targeted bacterias and determine the formulations in which they survive the best. Additionally, she/he will study the conditions in which the bubbles or droplets are stable over time, whether the adsorption of the bacteria at the interface can be obtained and whether it improves the stability of the materials.

Profile

Ideal candidates hold an MSc degree either in physics, chemical or materials engineering, materials science, or a related discipline and have a background in soft matter, physical chemistry, chemical or material engineering, or related fields. Experience in microbiology or biophysics is beneficial. Additionally, they should not have spent the 12 past months in France. They should be fluent in English. Knowing

some French is beneficial. We are looking for enthusiastic students attracted by multidisciplinary with scientific curiosity.

Conditions

Starting date : ideally January 2025 (can be postponed if needed); duration of the contract 36 months

Net monthly salary 2643 euros

Several training events to be held in the consortium in Switzerland, Crete, Germany, Belgium

Contacts

Cecile.monteux@espci.fr theo.merland@espci.fr Florence.elias@espci.fr

Send a CV, marks of you Bachelor and masters thesis and 1 letter of recommendation or 2 contacts of references

Reference

[1] V. Y. Grinberg and V. Tolstoguzov, *Food Hydrocolloids* 11, 145 (1997).