

Study of dynamics and high-value compounds production in microalgal biofilms under pulsed light

Microalgae have been identified as a promising biomass feedstock for the production of biofuels, feeds, foods and high-value molecules (pigments, polysaccharides, polyunsaturated fatty acids, ...) with applications in markets such as cosmetics, pharmaceutical, nutritional, and aquaculture. They are mostly cultivated as planktonic cells suspended in liquid nutrient medium in open (raceways) or closed (photobioreactor) reactors and lately using biofilm-based systems. A biofilm is an assemblage of microbial cells that are irreversibly associated with a surface and enclosed in a matrix of extracellular polymeric substances. Its architecture (spatial arrangement of microorganisms, cells clusters, extracellular polymers and particulates) is highly heterogeneous both in space and time. Biofilms are ubiquitous in nature and highly used for bioremediation and industrial bioprocess purposes.

In the frame of this Master's internship, the student will characterize photosynthetic biofilms growing on textile supports using optical methods such as spectroscopy and microscopy. The student will also work in close collaboration with a Master student as a part of an European project.

Tasks: (1) After an initial bibliographic study, the student will set-up a dedicated reactor to develop photosynthetic biofilms on textile supports. The reactor will be used to assess (2) the effect of different light spectra/intensities and of (3) flashing light conditions on biofilm growth and on the production of high-value compounds.

Acquired knowledge and skills: theoretical and experimental knowledge on microbial cultures, microalgae and biofilms. Among the laboratory techniques that will be used: culture of microalgae (algae biofilm reactor), confocal laser scanning microscopy, spectroscopy (Vis and IR), quantification of pigments and statistical analysis.

This project will be carried out in the Laboratory of Chemical Engineering and Materials (LGPM), CentraleSupélec, Gif-sur-Yvette in collaboration with the Department of Industrial Engineering of the University of Padova.

Responsible of the project: Filipa Lopes (filipa.lopes@centralesupelec.fr) (CentraleSupélec), Eleonora Sforza (University of Padova) (eleonora.sforza@unipd.it), Andrea Fanesi (CentraleSupélec) (andrea.fanesi@centralesupelec.fr), Nicola Trivellin (University of Padova) (nicola.trivellin@unipd.it).

How to apply: send CV to Filipa Lopes.