POLITECNICO DI MILANO

PhD in CHIMICA INDUSTRIALE E INGEGNERIA CHIMICA / INDUSTRIAL CHEMISTRY AND CHEMICAL ENGINEERING - 37th cycle

THEMATIC Research Field: CASCADE BIOCATALYSIS FOR THE GREEN AND SUSTAINABLE SYNTHESIS OF FINE CHEMICALS

Monthly net income of PhDscholarship (max 36 months)
€ 1325.0 In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	The main focus of the project is the development and optimisation of cascade biocatalytic processes (comprising two or more subsequent enzymatic steps) for the preparation added-value products such as pharmaceuticals, agrochemicals and fragrances. The application of integrated enzymatic steps overcomes the limitations of traditional chemical synthesis and provides great advantages in terms of environmental sustainability and process safety.The first part of the project will be dedicated to a detailed literature search to identify a range of target molecules and their possible chemical and biocatalytic synthetic approaches. Chemical synthesis of starting materials for the biotransformations and reference samples of the products will be carried out, along with the development of suitable analytical methods to monitor the bioconversions.The work will be focused on the obtainment of new biocatalysts and their screening and development against a range of substrates and transformations. Exploiting molecular biology techniques of cloning and mutation/evolution, libraries of new enzymes and variants will be developed. Their screening will be performed with traditional spectroscopic and chromatographic assays, as well as with a recently developed technique based on mass spectrometry imaging on a solid support.Lastly, preparative-scale reactions using the most promising catalysts developed in

	the project will be optimised in batch mode and intensified with enzyme immobilisation and flow chemistry, in order to achieve higher productivity and scale.
Methods and techniques that will be developed and used to carry out the research	A key innovative aspect of the project will be the development of a mass spectrometry (MS) imaging-based assay to monitor rapidly and efficiently the outcome of a large number of biotransformations. This activity will be performed in collaboration with a leading group in MS-imaging in Pisa.Moreover, the candidate will gain multidisciplinary experience across different fields, including chemical synthesis, molecular biology, chemical engineering and process intensification.
Educational objectives	The candidate will learn to conduct a proper bibliographic research, to safely work in a specialized chemical lab, to carry out structural determination of organic compounds, to develop a biocatalyst and to work in an international team.
Job opportunities	The candidate, after graduation, will constitute a valuable resource for the biotech and chemical industry at an European level, and will also be prepared to enter the Academic career.
Composition of the research group	1 Full Professors 2 Associated Professors 2 Assistant Professors 5 PhD Students
Name of the research directors	Dr. Fabio Parmeggiani

Contacts
Website: https://www.cmic.polimi.it/en/ricerca/elenco-gruppi-di-ricerca/biocatlab/ fabio.parmeggiani@polimi.it

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad

Amount monthly	566.36 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
Educational activities (funding for participation in courses, summer schools, workshops and conferences) - financial aid per PhD student per year:1st year: -2nd year: about 1.500 euros per student3rd year: about 1.500 euros per student Teaching assistantship: availability of funding in recognition of supporting teaching activities by the PhD student:There are various forms of financial of for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities within the limits allowed by the regulation