

(BL111/2022-IST-ID)

Research Studentships (for students of a course that does not award an academic degree, Master or Integrated Master students)

Applications are open for 2 (number) Research Studentship(s), within the framework of project/R&D institution “Towards the biomimetic conversion of alkylamines with molecular metal complexes for hydrogen generation, detoxification and synthetic transformations” at /Centro de Química Estrutural, Departamento de Engenharia Química, Association of Instituto Superior Técnico for Research and Development (IST-ID), (EXPL/QUI-QOR/1079/2021), financed by national funds through FCT/MCTES (PIDDAC), under the following conditions, under the following conditions:

Scientific Area: Synthesis, Molecular Structure and Analytical Chemistry, (Síntese, Estrutura Molecular e Análise Química)

Admission Requirements:

- *Research Studentships (for students of a course that does not award an academic degree):*

a) to hold a bachelor or master degree and be enrolled at a course that does not award an academic degree and it is integrated in the educational project of a higher education institution, performed in association or cooperation with one or several R&D units;

b) not to exceed with this contract, including the possible renovations, an accumulated period of two years in this type of studentship, continuously or with interruptions.

- *Research Studentships (for Master students):*

a) To be enrolled at an integrated master or a master.

Workplan: - Work in the areas of organic and inorganic synthesis, green chemistry & sustainable chemistry and hydrogen production.

- Experimental project with analytical methods (e.g. GC, GC-TCD, GC-MS, IR, ESI-MS, NMR, TEM) for product identification and analysis of the catalysts.

- Interpretation of analytical results, preparation of reports and publications.

Summary: A group of microorganisms, the methylotrophs, is capable of using small organic molecules such as methylamine for energy conversion and for detoxification processes. Aqueous methylamine therefore has the potential to be an energy source and to enable the conversion of methylamine from, for example, wastewater streams. Inspired by Nature, the project is based on the principles of natural processes of detoxification of methylamine, via formaldehyde, into carbon dioxide. The main challenge is to mimic the enzymatic reactions that make it possible to convert methylamine into formaldehyde and ammonia. Copper is a critical component of natural enzymes, and it is intended to mimic this catalytic capacity through the development of synthetic catalysts. The proposed approach is the synthesis and use of biomimetic copper complexes to convert methylamine into formaldehyde and ammonia; in the presence of such dehydrogenase enzyme mimetics, the formaldehyde formed *in situ* is decomposed into molecular hydrogen and carbon dioxide. Methylamine will be the model system for deamination, but alkylamines in general will also be tested for conversion to aldehydes. It is expected to apply this reactivity in more complex systems, namely, in tandem processes in which the formaldehyde formed *in situ* acts as a source of hydrogen in hydrogen transfer reactions. In addition, dehydrogenative cross-coupling reactions can be performed using amines as substrates under oxidative and reductive conditions.

The results will be disseminated in journals and conferences to the scientific community and results of certain interest for the public, will be communicated through press releases and social media channels. More information:

<https://fenix.tecnico.ulisboa.pt/homepage/ist428147/fct-pex-project---biomalametal>

Legislation and Regulations: Statute of Scientific Research Fellow, approved by Law nr. 40/2004, of August 18, as worded by Decree-Law nr. 123/2019, of August 28; FCT Regulation for Research Studentships and Fellowships, available on <https://www.fct.pt/apoios/bolsas/docs/RegulamentoBolsasFCT2019.pdf> and <https://dre.pt/application/file/a/127230968>.

Workplace: The work will be developed at the Centro de Química Estrutural (Coordination Chemistry and Catalysis Group), of Association of Instituto Superior Técnico for Research and Development (IST-ID), under the scientific supervision of Dr. Martin Prechtel, Ana Maria Faísca Phillips and Prof. Fátima Guedes da Silva.

Duration: The research fellowship(s) will have the duration of 11 months. It's expected to begin in July 2022, and the fellowship is not renewable.

Monthly maintenance allowance: According to the values for Research Fellowships awarded by FCT in Portugal (<http://www.fct.pt/apoios/bolsas/valores>), the amount of the monthly maintenance allowance is €875,98, being the payment method an option of the Fellow by Wire Transfer/Check.

Selection methods: The selection methods will be the following: Evaluation of Curriculum Vitae; specific interests/knowledge/skills about synthetic chemistry and analytical chemistry; and interview (if necessary), with the respective weight of 40 (CV): 40 (interests/specific knowledge/skills): 20 (interview).

Composition of the selection Jury: Dr. Martin Prechtel, Prof. João Tomé, Prof. Dr. Fátima Guedes and Prof. Dr. Alexander Kirillov

Announcement/ notification of the results: The final evaluation results will be communicated to all applicants by email.

Deadlines and procedures of complaint and appeal. A complaint may be lodged from the final decision within 15 working days, or an appeal to the Executive Board of IST-ID within 30 working days, both counted from the respective notification

Application deadline and formalization: The call is open from May 27 2022 until June 24, 2022.

It is mandatory to formalize applications with the submission of the following documents: i) B1 Form – Fellowship application (<https://ist-id.pt/concursos/bolsas/>); ii) *Curriculum Vitae*; iii) academic degree certificate, where applicable; iv) proof of enrollment at an academic degree course (Master or Integrated Master) or at a course that does not award an academic degree; v) motivation letter; vi) (for holders of Bachelor or Master degrees who are enrolled at a course that does not award an academic degree) declaration on honour that the applicant does not exceed with this contract an accumulated period of two years in this type of studentship, continuously or with interruptions. Optional (vii): 1 or 2 letter(s) of recommendation of a professor/supervisor (previous/current).

Applications must be submitted to the email: martin.prechtel@tecnico.ulisboa.pt e fatima.guedes@tecnico.ulisboa.pt