

Scientific Initiation Studentships

Applications are open for 21 Scientific Initiation Studentships, within the framework of project “Verão com Ciência” no CQE IST-ID, (1801P.01198), financed by national funds through FCT, under the following conditions:

Scientific Area: Chemistry (physical, analytical, synthetic, theoretical, materials, biological, medicinal, sustainable and related areas

Admission Requirements:

- a) *To be enrolled at a professional higher technical course, at a bachelor degree, at an integrated master or master degree, or to have a bachelor 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 one year in this type of studentship, continuously or with interruptions;*
- c) *not to have held any other fellowship directly or indirectly funded by FCT.*

Workplan: The 21 R&D internships are organised into 16 work plans (WP) divided into activities (A). The R&D internships aim of assisting CQE researchers in experimental activities, data collection, analysis, and dissemination. With this opportunity, young students will have the opportunity to develop essential technical skills in the context of scientific research, as well as transversal skills such as teamwork capacity, tolerance in the face of uncertainties and project planning skills, that represent a differentiation factor not only for the completion of their studies but also for integrating future work environment in R&D.

The applicants can apply to 2 (two) internships, with a clear indication of which one is the first and second preference. Please include the work plan number (WP#) and the full title of the work plan in the body of the email.

(email to: cqeapoio@tecnico.ulisboa.pt

eg. “*Preference 1: WP3: Zinc oxide nanoparticles for advanced applications; Preference 2: WP5: Nanostructured Functional Stone Coatings*”)

The work plans are listed below:

WP1: Extraction of ω -3FA from microalgae using green processes. This work aims at studying a green process for the extraction of ω 3-compounds from microalgae. PLE technique will be used and the effect of biomass pre-treatment, solvent type and temperature on the extraction yield will be assessed; A1.1: Biomass cell disruption studies: High pressure homogenization (HPH) and ball mill will be studied; A1.2: Selection of the solvent: Three GRAS solvents will be tested for its PLE extraction efficiency; A1.3: Study of the optimal extraction temperature. PLE experiments from 40 to 200 °C will be performed to assess the maximum yield. The main deliverable from this WP will be the determination of the best operational parameters for PLE of ω 3-compounds from microalgae. Report until 30 of September (1.000 characters with no spaces). Principal Research (PR): B. Nobre (Project: UIDB/00100/2020 and UIDP/00100/2020). **Number of vacancies: 1**

WP2: SC CO₂ micronization of pharmaceuticals. This work aims at studying the production of micro and nanoparticles of pharmaceutical ingredients using the supercritical antisolvent process (SAS). The effect of

pressure and temperature on the particle size (PS), particle size distribution (PSD) and yield of the process will be assessed. A2.1: Selection of the best organic solvent for the SAS micronization of the pharmaceutical compound; A2.2: SAS micronization of pharmaceutical compound at pressures from 100-200bar and temperatures up to 60°C; A2.3: Evaluation of the PS and PSD of the compound micronized in task A1.2. The main deliverables from this WP will be the determination of the best conditions of pressure and temperature for the SAS process, to produce micro or nanoparticles of the pharmaceutical compound. Report until 30 of September (1.000 characters with no spaces). Principal Research (PR): B. Nobre (Project: UIDB/00100/2020 and UIDP/00100/2020). **Number of vacancies: 1**

WP3: Zinc oxide nanoparticles for advanced applications. The goal is to develop new synthetic strategies for the preparation of zinc oxide. This project will develop new synthetic strategies through the rational selection of the components (zinc source, solvent) and reaction conditions (pH, temp.) The new zinc nanoparticles with precise properties will open new opportunities for the application zinc oxide based nanomaterials. Report until 30 of September (1.000 characters with no spaces). PR: C. Baleizão (Lisboa-01-0145-Feder-032444 – PTDC/CTM-CTM/32444/2017). **Number of vacancies: 1**

WP4: Mesoporous silica nanoparticles in stimuli responsive templates. To develop a hybrid nanocontainer based on mesoporous silica nanoparticles with a dual-pore system for selective control release. The dual pore system will be obtained using two templates, that can be removed selectively through different stimuli. The potential of these materials is very high, with applications in catalysis, corrosion, health and energy. Report until 30 of September (1.000 characters with no spaces). PR: C. Baleizão (Lisboa-01-0145-Feder-032444 – PTDC/CTM-CTM/32444/2017). **Number of vacancies: 1**

WP5: Nanostructured Functional Stone Coatings. Development of functional coatings for stone materials. The new coatings will be based in nanostructure materials and target water and stain repellency properties, with large potential to increase the value of stone products. Report until 30 of September (1.000 characters with no spaces). PR: J. Farinha (PTDC/CTM-COM/1581/2021). **Number of vacancies: 1**

WP6: Light propelled nanovehicles for drug delivery. The goal of this project is to add self-propulsion capabilities to silica nanovehicles, transforming them in versatile nanorobotic tools for drug delivery applications. We will prepare traceable Janus nanoparticles (JNPs), composed by a silica nanoparticles containing a fluorescent dye in the structure, and a gold nanostructure in half their outer surface. Irradiation of the gold with far red/near infrared light will produce heat, propelling the JNP in the direction opposite the gold nanostructure. The JNPs will be produced by a high yield process based on wax microparticle templating. Report until 30 of September (1.000 characters with no spaces). PR: J. Farinha (PTDC/CTM-COM/1581/2021). **Number of vacancies: 1**

WP7: Preparation and Characterization of Therapeutic Eutectic Solvents based on Flavonoids and Terpenes. A7.1: Preparation of DES using natural compounds with therapeutic properties that can be used in the pharmaceutical field; A7.2: Mechanochemistry will be here explored for the preparation of these DES; A7.3: The solid-liquid diagram, chemical and biological properties will be measured. The main deliverable from this WP is new solvents; new water solubility and partition coefficients, measurements of viscosity, density and also biological activity. Report until 30 of September (1.000 characters with no spaces). PR: I. Marrucho
Number of vacancies: 1

WP8: Studying the properties of alcohols for new drop-in fuels. A8.1: Selection of the alcohol based on its capability of acting as a drop-in fuel; A8.2: Characterization of the physical-chemistry properties of the chosen alcohol (density, viscosity, among others); A8.3: Evaluation of the phase equilibria of binary and ternary mixtures containing the alcohol. Report until 30 of September (1.000 characters with no spaces). The main deliverable from this WP will be new experimental results that will allow to conclude about the fuel properties of the chosen

alcohol. A poster will be presented at the 2nd Chem & BioChem Students Meeting (15th July, FCUL) and a scientific publication will be considered at the end of the project. Report until 30 of September (1.000 characters with no spaces). PR: A. Cristino (UIDB/00100/2020 & UIDP/00100/2020). **Number of vacancies: 2**

WP9: Water or Alcohol what is the best pair for an ionic liquid. A9.1: Biblio. research; A9.2: Characterization of the physical-chemistry properties of binary mixtures of alcohol and ionic liquid; A9.3: Result interpretation and comparisons. Report until 30 of September (1.000 characters with no spaces). The main deliverable from this WP will be new experimental results. A poster will be presented at the 2nd Chem & BioChem Students Meeting (15th July, FCUL) and a scientific publication will be considered at the end of the project. Report until 30 of September (1.000 characters with no spaces). PR: Â. Santos; L. Nobre (UIDB/00100/2020 and UIDP/00100/2020). **Number of vacancies: 1**

WP10_11: New IL-based mixtures for absorption refrigeration. A10.1 - Bibliography research; A10.2: Study of the heat capacity and enthalpy of mixing of the selected mixture at different temperatures; A10.3: Result interpretation and comparisons with mixtures used nowadays in absorption refrigeration. The main deliverable from this WP will be new experimental results that will allow to conclude about the viability on the use of choline acetate aqueous mixtures for absorption refrigeration. The contribution to a scientific publication will be considered at the end of the project. Report until 30 of September (1.000 characters with no spaces). PR: F. Santos (UIDB/00100/2020 & UIDP/00100/2020). **Number of vacancies: 2**

WP12: Development of sodium-based-eutectic solvents for supercapacitor applications. A12.1: Solid-liquid phase equilibria of DES using sodium salts and organic acids using DSC; A12.2: Thermodynamic characterization of DES-based on solid salts. The main deliverable from this WP is new thermodynamic and phase equilibrium data for DES based on sodium salts. Report until 30 of September (1.000 characters with no spaces). PR: I. Marrucho. **Number of vacancies: 1**

WP13: Synthesis of photoactive materials. A13.1: Synthesis and characterization of new dyes: The main goal of this activity is to synthesize new photosensitizers (PSs) based on porphyrin molecules; A13.2: Photo-physical and -chemical studies: In this task primary photo-physical and -chemical studies of the new PS molecules/hybrids will be performed; A13.3: Immobilization of the dyes on TiO₂ and Au nanorods: Develop new active hybrid (nano)materials based on covalent or supramolecular strategies for light-based technologies. The main deliverables from this WP are: New photoactive dyes; New (nano)formulations for cancer photomedicine; New materials for organic solar cells. Report until 30 of September (1.000 characters with no spaces). PR: J. Tomé. **Number of vacancies: 2**

WP14: Ribonucleosides stability and prebiotic evolution. A14.1: Mechanochemical studies of ribonucleosides in presence of carbonate and metal transition ions; A14.2: Characterisation of products by NMR spectroscopy; A14.3: Characterisation by X-ray-diffraction of crystals formed after solubilisation of products. The main deliverable from this WP is to study why ribonucleosides never have been detected in meteorites; these results can suggest more plausible pathways of prebiological evolution. Report until 30 of September (1.000 characters with no spaces). PR: J. Silva. **Number of vacancies: 1**

WP15: Sphingolipid hydroxylation as a structural feature modulating membrane properties and Sphingolipid hydroxylation in antifungal activity. A15.1: To evaluate the importance of the sphingolipid hydroxylation pattern for the formation and stability of gel domains. A15.1.1: The biophysical properties of membrane model systems containing sphingolipids exhibiting different hydroxylation profiles will be studied by fluorescence spectroscopy. Steady-state fluorescence intensity and anisotropy, as well as fluorescence lifetimes, will be obtained. A15.2: To study the relationship between sphingolipid hydroxylation patterns and the effectiveness of different antifungals in inhibiting yeast growth. A15.2.1: Antifungal susceptibility of yeast strains with different sphingolipid hydroxylation patterns to different antifungals will be performed through the microdilution method to determine

its minimal inhibitory concentration. Report until 30 of September (1.000 characters with no spaces). PR: R. Almeida; J. Marquês (EXPL/BIA-BFS/1034/2021) **Number of vacancies: 2**

WP16: Mercury toxicokinetics in saltmarsh plants. This WP1 will study the uptake, distribution, accumulation and elimination of Hg(II) in a saltmarsh plant species *Halimione portulacoides*. Two seasons will be considered (W/S) and the exposure experiments will be done under current environmental conditions and by simulating a future scenario. A16.1: Long-term Hg exposure experiment with winter plants; A16.2: Short-term Hg exposure with summer plants; A16.3: Long-term Hg exposure experiment with summer plants. A16.4 Data analysis, dissemination and Poster Pitch of the main results. The main deliverables from the WP16 are: Data compilation and analysis of all the total Hg quantifications in all the Hg exposure experiments. Evaluate the effect of plant activity considering both seasons and photoperiod conditions in current environmental conditions and simulating future change scenarios. The distribution and accumulation of Hg(II) in Hp plant will be clarified upon waterborne exposure of the root area, as well as the Hg translocation from roots to the aerial parts of the plants. Also, the extent of Hg release as Hg⁰ by the leaves to the atmosphere will be estimated. The impact of future change scenarios on these processes will be also addressed. Presentation of the results obtained concerning the determinations and the clarifications made in WP16. Report until 30 of September (1.000 characters with no spaces). PR: R. Cesário (PTDC/CTA-GQU/31208/2017) **Number of vacancies: 3**

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 CQE of Associação do Instituto Superior Técnico para a Investigação e o Desenvolvimento, under the scientific supervision of José Nuno Canongia Lopes.

Duration: The research fellowships will have the duration of 1 months. It's expected to begin in August/September 2022, and may not be eventually renewed.

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 € 486,12, being the payment method an option of the Fellow by Wire Transfer/Check.

Selection methods: The selection methods will be the *Curriculum evaluation*, with the respective weight of 100%.

Composition of the selection Jury: José Nuno Canongia Lopes, Fernando Antunes, Matilde Marques, Carlos Baleizão.

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 July 28 until August 3, 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 or at a course that does not award an academic degree; v) motivation letter; vi) declaration on honour that the applicant does not exceed with this contract,

including the possible renovations, an accumulated period of one year in this type of studentship, continuously or with interruptions, and has not held any other fellowship directly or indirectly funded by FCT.

Applications must be submitted to the email: cqeapoio@tecnico.ulisboa.pt