

(BL54/2021-IST-ID)

Research Studentships doing Master or Integrated Master students

Applications are open for 1 Research Studentship, within the framework of FCT project “**Material’s Research with Radioactive Isotopes and Nuclear Techniques at ISOLDE-CERN**” (CERN/FIS-TEC/0003/2019), financed by national funds through FCT/MCTES (PIDDAC), under the following conditions:

Scientific Area: Tecnologias Nucleares e Proteção Radiológica (Departamento de Engenharia e Ciências Nucleares)

Admission Requirements: Having completed a bachelor's degree and be enrolled in a master's degree.

Academic degrees obtained in foreign countries shall be registered by a Portuguese institution, according to the Decree-Law nr. 66/2018, of August 16th, and the Ordinance nr. 33/2019, of January 25th. It is mandatory to present the certificate to sign the contract. More information is available on: <https://www.dges.gov.pt/pt/pagina/reconhecimento?plid=374>

Workplan:The particular objectives to be achieved by the fellow are as follows:

TITLE: Molybdenum trioxide (MoO₃) doping studies.

CONTEXT: MoO₃ is a wide gap semiconductor with a two-dimensional crystalline structure. The atomic planes in the [010] direction interact by weak Van der Waals forces where defects, impurities and small molecules are preferably incorporated, altering the electrical properties of the crystal and opening the way for the development of chemical or biological sensors. In particular, it was observed that indium doped MoO₃ is a p-type semiconductor, which we intend to investigate in detail.

OBJECTIVES:

a) in our CTN laboratories, implantations of stable In will be carried out in several doses and the consequences will be evaluated by measuring macroscopic properties, crystal quality and electrical conductivity.

b) in our CERN-ISOLDE laboratories, the radioactive isotope ¹¹¹In (2.8d) will be used in perturbed angular correlations (PAC) measurements to provide information at the atomic scale. Through the measurements of the local electronic charge density and symmetry distributions (Electric Field Gradient), the implanted radioactive nuclei act as nano-spies of the probe's environment in the crystalline lattice. In this way, the lattice site(s) occupied by In are determined, its interaction with defects, electronic and magnetic states, that is, we obtain a complementary nanoscopic scale view of the phenomena responsible for the macroscopic effects.

Based on the tasks mentioned above and in collaboration with the team, the candidate must write reports, communications and scientific articles in English for publication in international journals.

Legislation and Regulations: Lei n.º 40/2004, de 18 de agosto (Estatuto do Bolseiro de Investigação Científica), na redação que lhe foi dada pelo Decreto-Lei n.º 123/2019, de 28 de agosto; Regulamento de Bolsas de Investigação da FCT, disponível em <https://www.fct.pt/apoios/bolsas/regulamento.phtml.pt>

Workplace: The work will be developed at the Nuclear Science and Technology Center (C2TN), Technological and Nuclear Campus (CTN), of the Instituto Superior Técnico of the University of Lisbon with possible trips to ISOLDE-CERN for 1-2 weeks, under the scientific guidance of Dr. Katharina Lorenz and Doctor João G. Correia.

Duration: The scholarship will have an initial duration of **6 months**, starting in May 2021. it can be extended for periods of 3 months up to a maximum duration of one year.

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 €835,98, being the payment method an option of the Fellow by bank transfer/Check.

Selection methods: The selection methods to be used will be the following: curriculum evaluation and individual interview by electronic means, with the respective valuation of 50% curriculum evaluation and 50% individual interview.

The scholarship candidate must have completed a Bachelor's degree or equivalent in the field of Materials Engineering, Physics, Physical Engineering or the like and be able to carry out a master's thesis within the scope of the scholarship. He/she should be interested in the study of materials, in particular using techniques for modifying properties and / or characterization based on ion implantation for doping and / or analysis with stable or radioactive probe elements. For the evaluation of the candidate (a) will be particularly considered the knowledge and eventual experience in techniques of characterization of crystallographic and electrical properties and, of modification of properties and / or analysis by ion beams. Particularly appreciated will be the knowledge and experience in analysis of local probe hyperfine nuclear methods of measurements of electric field gradients / magnetic fields, in experiments of perturbed angular correlations. The candidate will work in a research group with specialists in experimental and theoretical techniques in the characterization of advanced materials, so good communication skills are required.

Composition of the selection Jury: Dr. João Guilherme Correia, Dr. Katharina Lorenz, Dr. Marco António Baptista Peres

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 the 23 April to the 7 May 2021.

It is mandatory to formalize applications with the submission of the following documents:

- i) B1 Form – Fellowship application (www.ist-id.pt);
- ii) *Curriculum Vitae*;
- iii) *academic* degree certificate, where applicable;
- iv) proof of enrollment at an academic degree course (Master or Integrated Master);
- v) motivation letter.

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