

(BL75/2019\_IST-ID)

## CALL FOR 1 (ONE) MASTER RESEARCH FELLOWSHIP

Applications are open for 1 (one) Master Research Fellowship, within the framework of project/R&D institution CaRECI - Carbon Reduction Emissions in the Cement Industry/CQE,IST-ID, PTDC/AAG-MAA/61955/2014, financed by national funds through FCT/MCTES (PIDDAC), under the following conditions:

**Scientific Area:** Chemical Engineering, Energy Engineering and Management.

**Admission Requirements:** Master degree\* in Chemical Engineering or in Energy Engineering and Management, or related areas. It will be considered as factors of preference: to have laboratory experience in techniques for testing the capacity of CaO-based sorbents to capture CO<sub>2</sub> by Ca-looping technology, namely, in fixed bed reactor and fluidized bed reactor facilities; and also to have experience in advanced analytical techniques for the characterization of solid micro and mesoporous materials such as: sorption of N<sub>2</sub>, XRD, TGA, Hg porosimetry and SEM).

\*Applicants with foreign degrees shall have the degree recognized in Portugal, under the terms of Decree-Law nr. 66/2018, August 16<sup>th</sup>.

### **Workplan: Optimization of experimental conditions in a fluidized bed reactor for Ca-looping cycle CO<sub>2</sub> capture using natural geological materials and waste resources**

Ca-looping is one of the most promising processes for CO<sub>2</sub> capture based on the reversible chemical reaction between CaO-based sorbents and CO<sub>2</sub> to form CaCO<sub>3</sub>. During the calcination step CO<sub>2</sub> is selectively released from CaCO<sub>3</sub>, and if this step is carried out under a higher CO<sub>2</sub> partial pressure, a pure stream of CO<sub>2</sub> can be generated suitable for storage or for conversion processes (e.g. fuel, chemicals).

Currently, the main Ca-looping challenge for CO<sub>2</sub> capture is related to the decay of the sorbent reactivity with increasing number of CO<sub>2</sub> capture cycles. To minimize this limitation, the CaRECI project is currently studying the CO<sub>2</sub> carrying capacity of several CaO-based sorbents and techniques to improve the sorbents sintering resistance. The work plan is framed within Tasks 3 and 4 of the CaRECI project and include the use of natural geological resources CaO-based sorbents (e.g. limestone, dolomite, marble powder) and waste resources (e.g. spent FCC catalysts, ash) as stable supports for post-combustion CO<sub>2</sub> capture by the cyclic carbonation-calcination process. The main tasks of this fellowship include the optimization of the operation conditions of a fluidized bed reactor for Ca-Looping CO<sub>2</sub> capture and the assessment of different sorbents resistance to the attrition and fragmentation. The reactivity, stability and kinetics of carbonation reaction of sorbents tested in the fluidized bed will be compared with previous results obtained in a fixed bed reactor, as well as, the sorbents textural, morphological and mineral properties using several advanced analytical techniques (sorption of N<sub>2</sub>, XRD, TG/DSC, SEM, Hg porosimetry, etc.). The results obtained will be used for the validation of a non-linear dynamic model for the simulation of the operation of the fluidized bed reactor system developed in task 4.

**Legislation and Regulations:** Lei n.º 40/2004, de 18 de agosto (Estatuto do Bolseiro de Investigação Científica) (*Statute of Scientific Research Fellow, approved by Law n. 40/2004, of August 18*); Regulamento de Bolsas de Investigação da Fundação para a Ciência e a Tecnologia em vigor (*Research Fellowships Regulation of the Foundation for Science and Technology in force*) ([www.fct.pt/apoios/bolsas/docs/RegulamentoBolsasFCT2015.pdf](http://www.fct.pt/apoios/bolsas/docs/RegulamentoBolsasFCT2015.pdf)); e Regulamento de Bolsas de investigação do IST-ID (Research Fellowships Regulation of IST-ID).

**Workplace:** The work will be developed at CATHPRO/CQE laboratories, Torre Sul – Departamento de Engenharia Química of Instituto Superior Técnico, under the scientific supervision of Professor Carla Costa Pinheiro and Dr. Paula Lourenço Teixeira.

**Duration:** The research fellowship(s) will have the duration of 3 (three) months. It is expected to begin in April/2019, and may be eventually renewed up to the maximum 4 (four) months.

**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 €989.70, being the payment method an option of the Fellow by Wire Transfer/Check.

**Selection methods:** The selection methods will be the following: Curriculum evaluation and individual interview\*, with the respective weights of 50% each.

**Composition of the selection Jury:** Carla Isabel Costa Pinheiro; Maria Filipa Gomes Ribeiro; Paula Lourenço Teixeira

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

**Application deadline and formalization:** The call is open from 28/3/2019 until 10/04/2019.

It is mandatory to formalize applications with the submission of the following documents: B1 Form – Fellowship application (<http://ist-id.pt/documentos/bolsas-de-investigacao/>) *Curriculum Vitae*, *academic degree certificate and motivation letter*. Applications must be submitted to the email: [carla.pinheiro@tecnico.ulisboa.pt](mailto:carla.pinheiro@tecnico.ulisboa.pt).