

**PUBLIC NOTICE OF OPENING OF THE INTERNATIONAL SELECTION COMPETITION PROCEDURE FOR THE  
HIRING OF DOCTORATE HOLDER UNDER OF DECREE-LAW N.O 57/2016, OF AUGUST 29TH, AS  
AMENDED BY LAW 57/2017 OF JULY 19TH AND SUPPLEMENTARY LEGISLATION**

**Notice nr. L01-A1/C<sup>5</sup>LAB - Sustainable Construction Materials Association**

The Administration Board of the Association Collaborative Laboratory C<sup>5</sup>LAB - Sustainable Construction Materials Association, decided to open an international selection competition for **ONE doctorate position for the exercise of activities of scientific research** in the scientific area of **Chemical Engineering** under the application nr. LISBOA-05-3559-FSE-000008, integrated in the notice for selection competition LISBOA-59-2018-39, which aims to support the hiring of highly qualified human resources, co-financed by Lisbon Regional Operational Program 2020, thematic area of Competitiveness and Employment, through the European Social Fund (ESF).

**I – Applicable legislation**

1. The competition shall be governed by the provisions set out in Decree-Law No. 57/2016, of August 29th, which approves a system for hiring PhD graduates aimed at stimulating scientific and technological employment in all areas of knowledge (RJEC), with the amendments introduced by Law No. 57 / 2017, dated July 19th, also taking into account the provisions of Regulatory Decree No. 11-A / 2017, of December 29th, as under the “Código do Trabalho” (Labor Code), approved by Law No. 7/2009, of February 12th, in its current wording.
2. The opening of this competition is under the article 19.<sup>o</sup> of RJEC and respecting the Acceptance Document, that lays down the rules governing the attribution of funds, between Operational Program for the Lisbon Region 2020 Directive Commission and C5LAB.

**II – Place of work**

The place of work is located at C<sup>5</sup>LAB head office, Edifício Central Park 3 Nr. 6- 4C, in Linda-a-Velha or in any facilities of its associates communicated in advance by C<sup>5</sup>LAB.

**III – Specific aspects of the contract to be concluded**

1. Under the terms of article 6 of Decree-Law nr. 57/2016, the contract shall be an employment contract for an uncertain term as defined by the Labor Code.

2. In its current wording, being the basis of contracting the execution of a service determined, precisely defined and non-durable, the term of the working contract will have the maximum duration of the project that supports it, which is expected to be 36 months. The minimum duration of the contract will not be less than 24 months.
3. The contract will be concluded for the initial level or category of scientific research career that best suit the selected candidate.
4. This tender is exclusively intended to fill the vacancy indicated and may be terminated until the homologation of the final ranking list of candidates and expiring with the respective occupation of the working position on offer.
5. The contract will be signed on an exclusive basis.
6. The contract to be concluded shall define the system of joint ownership regime for intellectual property rights that may result in the field of research.
7. Termination of the financing, termination of the project or completion of the tasks that are the subject of this competition shall determine the expiration of the contract that will operate with the communication referred to in article 345 (1) of the Labor Code.
8. The Contract shall be concluded by the President of the Executive Board of C<sup>5</sup>LAB together with a Vice-President.

#### **IV - Remuneration**

This tender is open for the **remuneration level** 54 of the single remuneration table (TRU), which corresponds to a monthly remuneration of 3.209,67 Euros.

#### **V – Description of the tasks to be performed**

Generically, the tasks to be performed will consist on the development of active, selective and stable catalysts for CO<sub>2</sub> methanation with hydrogen, its detailed characterization and catalytic testing

Several batches of methanation catalysts will be prepared based on zeolite supports (as powder and extrudates), in which different metal species will be impregnated allowing the search for high levels of activation of the reactants and to the enhancement of the methane formation selectivity as well. Active metals on the CO<sub>2</sub> hydrogenation, as Ni, Ru, etc., and metal oxides (mainly rare earths) will be dispersed over the zeolite supports Y, BEA, MOR, etc.

The prepared catalyst samples will be characterized concerning the following properties:

- Chemical composition: Si/Al ratio of the zeolite, before and after the preparation of each catalyst; level content of the supported active metal species and of the promoters (chemical analysis);
- Structural characterization: cristallinity (X-rays diffraction, powder method);
- Morphological properties: shape and dimensions of the dispersed metal particles and catalyst grains (electronic microscopies, SEM, TEM);
- Textural properties: assessment of micro and mesoporosity ( $N_2$  adsorption/desorption isotherms);
- Metal dispersion and dimensions distribution (chemical adsorption and TEM);
- Support acidity/basicity (base probe molecules adsorption followed by *in-situ* infra-red spectroscopy);
- Type and reducibility of metal species ( $H_2$ -TPR;  $O_2$ -TPO; *in-situ* DRS/UV-Vis-NIR).

The catalytic assessment of the samples will be carried out in experimental conditions similar to those of envisaged industrial applications concerning the reactants concentrations ( $CO_2$ ,  $H_2$ ), temperature, total pressure, presence in the feed of compounds as  $O_2$ , CO and  $H_2O$ , space velocity (GHSV). Eventual diffusion limitations will be analysed, as well as the *mise-en-forme* issues related to the scale-up in the use of the prepared catalysts.

The best catalyst samples will be tested in the presence of  $H_2O$  (2% vol.), in order to simulate an accelerated deactivation. The stability will be evaluated from long time-on- stream catalytic tests. After the tests some catalyst samples will be characterized concerning relevant parameters as cristallinity, porosity, metal species, Si/Al ratio.

Some batches of the best proved catalyst samples will then be prepared with grain dimensions in the range 150-350 micron, so that they can be tested in bench scale units. The *mise-en-forme* will be carried out diluting the powder catalyst sample in an alumina gel, followed by thermal treatments. The previously described characterization procedures will be repeated over these samples in order to detect eventual modifications induced by the scale-up.

The final catalytic tests will be carried out in a stainless steel bench scale reactor, using typical experimental conditions of the industrial transformation, namely concerning the presence of  $O_2$ ,  $H_2O$  (2-5% vol.), carbon monoxide (0-5% vol.), methane (0-5% vol.), keeping the stoichiometric relation  $H_2/CO_2 = 4$ , and total pressure in the range 1-5 bar. The composition of the effluent mixture from the reactor will be analysed using specific detectors for  $CO/CO_2$  and  $CH_4$ .

## **VI – Requirements for admission to the competition**

The competition is open for national candidates, foreigners and stateless persons who hold a doctoral (PhD) degree, as well as those to whom has been granted equivalence or recognition to the degree of “Doutor” under the Decree-Law nr. 66/2018, of August 16<sup>th</sup>. Therefore any formalities established therein must be completed by the date of the hiring in a field of knowledge or specialty that covers the scientific area of **Chemical Engineering** and are still in possession of a scientific and professional curriculum that reveals an adequate profile for the activity to be developed.

## **VII - Formalization of applications**

1. Applications are formalized by means of an application form addressed to the Executive Board of the Association Collaborative Laboratory C<sup>5</sup>LAB, requesting acceptance of the application and stating the identification of this notice, full name, affiliation, number and date of identity card, Citizen Card, or VAT number, date and place of birth, marital status, profession, residence and contact address, including e-mail address and telephone contact.
2. In the application form, the candidate must express his / her consent so that communications and notifications under this tender procedure can take place by email, to the email address indicated in the application.
3. The application shall be accompanied by **documents proving the conditions** laid down in point VII for admission to this invitation to tender, in particular:
  - a) Copy of certificate or diploma, or the request for recognition of the “Doutor” degree under the terms defined by Decree-Law No. 66/2018, of 16 August
  - b) PhD Thesis or equivalent document(s) that determined the award of this academic degree.
  - c) Detailed curriculum vitae, structured in accordance with the items in points IX.2 and IX.4, indicating the works, and adding a copy of them, that the candidate considers most relevant to each of the items in points IX.2, IX.4 e IX.5;

d) Other documents that the candidate justifies to be relevant to the analysis of his / her application.

e) Declaration of consent for the personal data processing.

4. Applicants must submit the documents referred in the preceding item in PDF format.
5. The application and documents may be submitted in Portuguese or English, although the President of the Jury, and when a member of the Jury is a non-native Portuguese speaker, may request that, within a reasonable time, the candidate translates into English a document previously presented in Portuguese.
6. The application, comprising the application form and other accompanying documents, must be submitted electronically to the address [contact@c5lab.pt](mailto:contact@c5lab.pt) up to the last day of the tender opening period, which is fixed at 10 working days after publication of this Notice.
7. Candidates who do not formalize correctly the application using the application form or who do not deliver all the documents referred to in point 3 or who present them unreadable, incorrectly completed, or invalid are eliminated.
8. The Jury shall have the right to require any candidate, in case of doubt and for the purpose of his/her admission to the competition procedure, to provide supporting documents for his/her declarations.
9. The jury is also entitled to require any candidate, in case of doubt and for the purposes of admission to competition, to present documentary evidence of the declarations in the submitted documents.
10. The false statements made by the candidates will be punished according to the law and determine the exclusion of the application.

#### **VIII - Approval on absolute merit**

1. The Jury will deliberate on its approval or rejection on absolute merit, by a justified vote where no abstentions are admitted.
2. Candidates who have a scientific and curricular path relevant to the scientific area(s) of the competition and taking into account their suitability for the additional weighting criteria identified in IX.4, and obtains a favorable vote of more than half of the members of the jury, will be approved on absolute merit.

## **IX - Selection procedures**

1. According to article 5 of RJEC, the selection is made through the evaluation of the scientific and curricular path of the candidates.
2. The evaluation of the scientific and curricular path focuses on relevance, quality and timeliness:
  - a) of the scientific, technological, academic, cultural or artistic production during the last five years and considered more relevant by the candidate;
  - b) of the activities of extension and dissemination of knowledge developed during the last five years, in particular in the context of promoting the culture and scientific practices considered by the candidate to be of greater relevance;
  - c) of the activities of extension and dissemination of knowledge developed during the last five years, in particular in the context of promoting the culture and scientific practices considered by the candidate to be of greater relevance;
  - d) of the activities of science, technology and innovation programs management or of the experience in observing and monitoring the scientific and technological system or higher education, in Portugal or abroad.
3. The period of five years referred to in the preceding paragraph may be increased by the jury, at the request of the candidate, when justified on grounds of suspension of scientific activity for socially protected reasons, namely for reasons of parental leave, prolonged serious illness, and other situations of unavailability for work legally protected.
4. The assessment criteria are set out in this entry, with the option mentioned in next point 5, with particular emphasis on the curriculum vitae and the contributions considered to be of higher relevance by the candidate in the last 5 years:
  - a) Quality of the scientific or technological, cultural or artistic production, considered more relevant by the candidate, and relevant to the project to be developed, which was given a weighting factor of 70% considering:
    - i) Scientific publications: a parameter which takes into account books, chapters of books, articles in scientific journals and international conference proceedings of which the applicant was the author or co-author, considering:

- its nature and integration in the cement area
- its impact;
- the scientific / technological level and innovation;
- international collaboration;
- the importance of contributions to the advancement of the current state of knowledge;
- the importance of the works that have been selected by the candidate as most representative, in particular as regards their contribution to the development and evolution of the scientific area for which the competition is open.

ii) Creation and reinforcement of laboratory facilities: parameter that takes into account the participation and coordination of activities by the candidate that resulted in the creation or reinforcement of laboratory infrastructure of experimental research support.

iii) Author and co-author of patents, models and industrial designs, taking into account their nature, territorial scope, technological level and the results obtained.

iv) Coordination and participation in scientific projects: a parameter that takes into account the participation and coordination of scientific projects by the candidate, subject to competitive bidding, considering:

- the territorial scope and its size;
- the technological level and the importance of the contributions;
- innovation

v) Accompaniment and orientation of students, trainees and research fellows: a parameter that takes into account the orientation of doctoral students, master's and undergraduate students, trainees and research fellows taking into account the number, quality, scope and scientific / technological impact of the resulting publications, theses, dissertations and final course papers, distinguishing especially the awarded works and the international recognition.

b) Activities of extension and dissemination of knowledge, particularly in the context of the promotion of culture and scientific practices, considered of greater relevance by the

candidate, and relevant to the project to be developed, which was given a weighting factor of 5% considering:

[select the relevant items]

- i) Industrial and Intellectual Property rights;
- ii) Services to the scientific community and to society: a parameter that takes into account the participation and coordination of scientific and technological dissemination initiatives and taking into account the nature and results achieved by them when carried out towards:
  - the scientific community, including the organization of conferences and conferences;
  - the media;
  - companies and the public sector

5. In weighting the evaluation criteria listed in the previous paragraphs 4 a) to d), each jury member may consider the following additional parameters under the following conditions:
- a) contribution to the development and evolution of topics CO<sub>2</sub> catalytic conversion and development of supported metal catalyst in the scientific area which the competition is open
  - b) contribution to the development and evolution of topics CO<sub>2</sub> catalytic conversion and development of supported metal catalyst in the scientific area in the research unit CQE- Centro de Química Estrutural
  - c) contribution to the development and evolution of topics CO<sub>2</sub> catalytic conversion and development of supported metal catalyst in the scientific area in the scientific project
  - d) contribution to the development and evolution of topics CO<sub>2</sub> catalytic conversion and development of supported metal catalyst in the scientific area using the methodologies of preparation and characterization of heterogeneous catalysts and catalytic tests of CO<sub>2</sub> methanation
6. The jury will select up to 3 (three) best candidates and invite them for a interview with a weighting factor of 25%.

#### **X - Classification of candidates**



1. Each member of the jury assigned a classification to each of the candidates in each evaluation criterion, on a scale of 0 to 100 points, ranking the candidates according to their classification consisting on the sum of the partial classifications assigned in each evaluation criterion, and taking into account the weighting factor given to each parameter.
2. Candidates shall be ordered by applying the successive voting method.
3. The final classification of each candidate is the one corresponding to his or her ranking resulting from the application of the method referred to in point X. 2.
4. The final deliberation of the jury is approved by the President of the Executive Board of C5LAB.
5. The list of admitted and excluded candidates as well as the final ranking list are advertised on the C5LAB website ([www.c5lab.pt](http://www.c5lab.pt)), and the applicants will be notified by email with receipt of delivery of the notification.

#### **XI - Prior Hearing**

After being notified, candidates have 10 working days to submit a formal rebuttal.

#### **XII - Jury**

1. In accordance with Article 13 of the RJE, the jury of the competition procedure is composed by:
  - Professor João Carlos Moura Bordado, Full Professor at IST, President of C5Lab Scientific Council, who presides the jury;
  - Professor José Manuel Lopes, Associate Professor at IST;
  - Engineer Paulo Rocha, S&I Director of CIMPOR and Vice-President of C<sup>5</sup>Lab
  - Professor Carlos Henriques, Associate Professor of IST, Project Coordinator of C<sup>5</sup>Lab
2. The Jury will deliberate on its approval or rejection on absolute merit, by a justified vote where no abstentions are admitted.
3. Within the term of 90 days, counted from the deadline for the presentation of the candidacies, the final decisions of the jury are given.
4. Minutes of the jury meetings are drawn up, which contain a summary of what has taken place in them, as well as the votes cast by each of the members and their reasons, being available to the candidates whenever requested.

### **XIII - Non-discrimination and equal access policy**

C<sup>5</sup>LAB actively promotes a policy of non-discrimination and equal access, so that no candidate can be privileged, benefited, disadvantaged or deprived of any right or exemption from any duty owing, in particular, to ancestry, age, sex, sexual orientation, marital status, family status, economic situation, education, social origin or condition, genetic heritage, reduced working capacity, disability, chronic illness, nationality, ethnic origin or race, territory of origin, language, religion, political or ideological beliefs and trade union membership.