

## CONVOCATORIA DE PRÁCTICAS INTERNACIONALES CALL FOR INTERNATIONAL INTERNSHIP

### 1. INFORMACIÓN DEL SUPERVISOR Host applicant information

NOMBRE Name

CARGO Position

CONTACTO Contact: Email

Teléfono Phone

DEPARTAMENTO/FACULTAD/INSTITUCIÓN Department/Faculty/Institution

Department of Chemistry, Royal Military Academy

TIPO DE ORGANIZACIÓN Organization type

EPLUS-EDU-HEI

ORGANISMO PUBLICO SI Yes  NO  
Public Body

SIN ANIMO DE LUCRO  SI Yes   
Non-Profit

TAMAÑO Size >250 employees

WEB

<http://www.rma.ac.be/en/>

### DISPONIBILIDAD PARA EVALUAR INFORMES DE CONVALIDACION DE CREDITOS ECTS

¿Es una prioridad para el supervisor que el estudiante valide los créditos?

Availability to evaluate ECTS credit validation reports

Is it a priority for the supervisor that the student validates ECTS credits?

It is not a priority, but I can do it

### 2. DESCRIPCION DEL PROYECTO Project description

FECHAS ORIENTATIVAS DE REALIZACION DEL PROYECTO

Wished/approximate dates for the mobility period

01/09/2023 to 15/12/2023

FLEXIBILIDAD DE FECHAS Yes

Flexibility in dates No

TÍTULO DEL PROYECTO Project title

Advanced humidity to electricity converter

NUMERO DE HORAS DE TRABAJO POR SEMANA Number of working hours per week

35

## PROGRAMA Detailed programme of the traineeship

**Context:** This project is aimed at the development of an innovative technology to exploit the atmospheric humidity for direct conversion to electricity, thus gaining a new sustainable source of renewable energy. The conversion principle is based on the fundamental characteristic of the surface of solids to maintain electroneutrality upon the adsorption of molecules from the gas phase. It combines at the micro level a sequence-chain of physicochemical, physical and electrophysical processes that take place on the interface of nanostructured oxide materials when interacting with water molecules from surrounding atmosphere, thus enabling direct humidity adsorption - electrical energy conversion. The proof of concept of this technology has been already delivered and the next step in this investigation is to increase its technology readiness level.

**Approach:** single and cycling water vapour adsorption-desorption experiments in static and dynamic conditions will be performed with different types of samples (mainly with metal oxides, but also metal organic frameworks, nanoporous carbon materials...). These materials will be thoroughly characterized by different techniques (adsorption isotherms, TG-MS, SEMEDX, XPS, XRD...) in order to link the water sorption behaviour with their surface, structural and textural properties. Based on the obtained results, an optimization of the material for this specific application will be performed.

**Role of the trainee:** the trainee will participate in the activities above described in the frame of an European project (CATCHER, 2022-2025, <https://catcherproject.eu/>). Besides from the experimental work, the trainee will also participate in the bibliographic search, the interpretation and discussion of the results, and the drafting of reports and/or presentations.

## CONOCIMIENTOS, HABILIDADES Y COMPETENCIAS QUE HAN DE ADQUIRIR LOS ESTUDIANTES Knowledge, skills and competences to be acquired by the end of the traineeship

- Learning the principles of water vapour sorption: how to do the tests in static and dynamic conditions, variables involved, calculations (capacity, kinetics)...
- Acquiring expertise in different characterization techniques of materials.
- Gaining knowledge on the interpretation and discussion of scientific results, as well as in the writing of scientific reports.
- Learning how to work in a research laboratory, in team and in the frame of an international on-going project. Interaction and exchange of results with other research groups.
- Improving the communication skills and knowledge of languages (the trainee will have the opportunity to learn French/Flemish).

## MONITORIZACION Monitoring plan

Regarding the experimental part, and since the trainee will be integrated in the routine tasks of an on-going project, the risks of not accomplishing the goals is very limited. In the case of unexpected events influencing the good progress of this particular project, the trainee would then participate in other collaborative projects in the field of water adsorption.

The trainee is expected to have permanent contact with the host scientist, especially at the beginning of the traineeship, and periodical meetings (once per week) will be scheduled in order to follow the progress of the work and the needs of the trainee

#### EVALUACIÓN Evaluation plan

- 1) Theoretical knowledge will be given by magistral lessons and supporting bibliographic material. A first evaluation will check if the basic concepts are fixed. Only once this goal is reached, we will proceed to the next step.
- 2) Experimental work: all the techniques and protocols will be explained in detail; then, the trainee will gradually increase his/her participation under supervision until he/she is able to work independently.
- 3) Discussion of results: the trainee will be asked to actively participate in the discussion of the results, this being a proper opportunity to identify additional actions needed to improve the formation.

#### ESPECIFICACIONES ADICIONALES EN LA INSTITUCIÓN DE ACOGIDA

Additional specifications of the host institution

#### OTRA INFORMACIÓN RELEVANTE Other relevant information

### 3. PERFIL Y REQUISITOS DEL ESTUDIANTE Student profile and requirements

AREA/S DE ESTUDIO Research area/s

Chemistry/Chemical Engineering ej. Química,  
Biología, Ingeniería Informática...

#### NIVEL DE ESTUDIO Level of studies

Preferably, applicants with a bachelor degree and enrolled in a Master's program. However, applications of students of the last year of the bachelor can be exceptionally accepted.

#### REQUISITOS PREVIOS DE CONOCIMIENTOS TECNICOS O EXPERIENCIA

Student required expertise and technical knowledge:

The student may have some experience in working in a chemical laboratory, and ideally in gas phase applications.

Regarding the theoretical knowledge, formation in chemistry and/or chemical engineering is a must, and notions of fundamentals of adsorption in gas phase will be needed.

#### IDIOMA Y NIVEL MINIMO RECOMENDADO PARA REALIZAR LAS PRACTICAS Language and minimum level recommended for internships

B2 English

#### REQUISITOS ADICIONALES DE LA INSTITUCION DE ACOGIDA

Additional requirements set by the host institution

Besides the Learning agreement, and given the military character of the Academy, it is possible that the trainee would eventually be asked to pass a security screening.