

1. Interested institution:

The Spanish National Research Council (CSIC)

C/ Serrano 117, 28006, Madrid (Spain)

www.csic.es

2. Brief Description of the Institution

The Spanish National Research Council (CSIC) is the largest public institution dedicated to research in Spain and the third largest in Europe. Belonging to the Spanish Ministry of Economy and Competitiveness through the Secretary of State for Research, Development and Innovation, its main objective is to develop and promote research that will help bring about scientific and technological progress, and it is prepared to collaborate with Spanish and foreign entities in order to achieve this aim. It has a staff of more than 13,000 employees, among these about 3,300 are permanent researchers and about 4,300 are pre- and post-doctoral researchers. The CSIC has 70 fully own institutes or centres distributed throughout Spain. In addition, it has 53 Joint Research Units with universities or other research institutions. There is also a delegation in Brussels and Rome.

CSIC has considerable experience in both participating and managing R&D projects and training of research personnel. Under the 7th Framework Programme CSIC has signed approximately 700 actions (including 97 coordinated by CSIC and 47 ERC projects). Funding wise, CSIC is listed the 1st organisation in Spain and the 5th in Europe in the 7th Framework Programme, with a total FP7 contribution of over 260 million euros. During the first calls of H2020, CSIC has had an intense participation in all programmes. It has been remarkable the participation in certain calls, such as ERC and Marie Curie, as well as in ICT, NMBP and Societal Challenges. In March 2015 CSIC has obtained 90 projects with a total financial contribution of 40 million euros.

3. Please tick the areas of research (as established in Marie Skłodowska Curie Actions)

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| <input checked="" type="checkbox"/> Chemistry (CHE) | <input type="checkbox"/> Environmental Sciences and Geology (ENV) |
| <input type="checkbox"/> Social Sciences and Humanities (SOC) | <input type="checkbox"/> Life Sciences (LIF) |
| <input type="checkbox"/> Economic Sciences (ECO) | <input type="checkbox"/> Mathematics (MAT) |
| <input type="checkbox"/> Information Science and Engineering (ENG) | <input type="checkbox"/> Physics (PHY) |

4. Research / Project Description

Title: Design of water-soluble NHC-based transition metal complexes for catalytic applications: immobilization on carbonaceous solid supports.

Project Description

The development of homogenous transition metal catalysts to promote efficient organic transformations is a research area in the vanguard of the scientific knowledge. The selectivity and activity of many homogenous catalysts allow for the preparation of high added value chemicals from simple and economic substrates by means of processes with high atom economy, diminishing the formation of residues and, therefore, with a minimum environmental impact. The main aim of the project is the development of new homogeneous catalysts with application in sustainable chemical processes. We will address the synthesis and characterization of new iridium, rhodium or ruthenium complexes bearing N-heterocyclic carbene ligands (NHC) with varied structural motifs: i) NHC ligands with a hemilabile coordinating group, ii) NHC-functionalized ligands for the preparation of hybrid catalysts supported on carbonaceous materials, iii) NHC ligands bearing hydrophilic ionic substituents for the preparation of water-soluble catalysts for biphasic or aqueous medium transformations.

The new catalysts will be applied for useful organic transformations including hydration reactions of unsaturated compounds, hydrogen transfer hydrogenation of ketones, aldehydes, α,β -unsaturated ketones, and imines, as well as for alkylation processes based on alcohol dehydrogenation reactions (hydrogen borrowing) directed to a wide range of substrates such as aromatic or heteroaromatic compounds and non-activated amides. In addition, dehydrogenative alkylations of alcohols and amines to produce esters and/or amides, will be also explored.

The covalent anchoring of NHC complexes on solid supports presents some advantages, such as air stability, an easily recovery and further re-cyclability of the catalysts without leaching processes, and finally an improvement in the catalytic activity comparing with the analogous homogeneous complex. In this context, new strategies for supporting our homogeneous catalyst on carbonaceous materials, multiwall carbon nanotubes (CNTs) and graphene oxide (GO), with control of the surface composition will be developed. The catalytic activity of the generated hybrid materials will be studied in the above-mentioned catalytic processes. In addition, reusability and stability of the supported catalyst will be evaluated. The different surface chemistry of the supports will be considered in order to tackle the influence of the support on the catalytic performance of the systems.

The efficient formation of H_2 and O_2 from water using sunlight is key for satisfying world energy needs in the future. The development of an artificial photosynthesis (AP) system that can mimic solar energy conversion in nature requires of efficient water oxidation catalysts (WOCs). In this context, the new water-soluble homogenous and heterogeneous catalysts will be applied for this process, including mechanisms investigations underlying these catalytic transformations in order to further improve the catalytic systems.

Selected references: *Carbon* **2015**, 83, 21–31; *Organometallics*, **2015**, 34, 926–940; **2011**, 30, 5493–5508; *ACS Catal.* **2013**, 3, 1307–1317.

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The applicant will be incorporated into the research group Homogeneous Catalysis by Organometallic Compounds of the Instituto de Síntesis Química y Catálisis Homogénea (ISQCH). The research group is lead by Prof. Luis A. Oro, (Highly Cited Researcher, <http://sorores.unizar.es/personales/LAO/oro.html>) and is formed by 10 permanent scientists of the University of Zaragoza and of the CSIC, as well as a number of pre-doctoral and post-doc researchers of different nationalities. The group possesses a large experience in Organometallic Chemistry and in Homogeneous Catalysis having published more than one hundred research papers in international journals of recognized international prestige in the last five years. The general aim of the research activity of the group is the development of new transition metal organometallic compounds and its applications as homogeneous catalysts including the immobilization on different solid supports. The group is currently financed by competitive research projects from public institutions as well as of contracts with chemical companies. The group undertakes an important work on academic and research formation at all the University levels.

For more information, see:

<http://www.isqch.unizar-csic.es/ISQCHportal/grupos.do?id=29>

<http://sorores.unizar.es/personales/LAO/oro.html>

5. Who can apply?

At the deadline for the submission of proposals (10/09/2015), researchers (*):

- shall be in possession of a doctoral degree or have at least four years of full-time equivalent research experience.
- must not have resided or carried out their main activities in the country of Spain for more than 12 months in the 3 years immediately prior to the abovementioned deadline.

6. Contact person

Prof. Dr. Jesús J. Pérez-Torrente
e-mail: perez@unizar.es

7. Applications: documents to be submitted and deadlines

- Curriculum vitae
- Letter of motivation
- At least two recommendation letters
- Deadline: May, 15th 2015

Please note that:

- Deadline of the next call for proposals for Marie Skłodowska – Curie Individual Fellowships is **September, 10th 2015**.



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- Oficina Europea is only responsible for the display of the expressions of interests received by the institutions; further contact and information requests will take place directly between the host institutions and the interested researchers.

(*) Further details on the Call and additional eligibility criteria can be found at the [Participants' Portal](#)