MSCA Postdoctoral Fellowships

HORIZON MSCA PF 2023

EXPRESSION OF INTEREST

instituto IMDEA energía

EXCELENCIA MARÍA DE MAEZTU

HR EXCELLENCE IN RESEARCH

Deadline for submission of documents
15th of July 2023

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Contact Person/ Scientist in charge

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Brief description of the Research Group

The Advanced Porous Materials Unit (APMU), headed by Dr Horcajada, is focused in the domain of porous multifunctional solids, from their synthesis design and shaping to their applications in diverse industrial and societal strategic fields (energy, environment and biomedicine). High-tech world-class scientific facilities are available at IMDEA Energy, ideally suited to the successful development of the proposed project. Among them, we can highlight: i) organic and inorganic synthesis (solvothermal, microwave, sonochemistry, mechanochemistry), including high-though put synthesis; ii) powder and single crystal X-ray diffractometers with multiple accessories (non-ambient conditions, PDF). iii) physi and chimi-sorption, iv) pycnometer, v) gas and liquid chromatography, vi) UV-vis, Raman, fluorescence, FT-IR (Temp-dependant), vii) TEM and FEG-SEM (equipped with EDX), viii) microanalysis and ICP ix) XPS spectrometer, x) TGA-DTA, xi) AFM, xii) NTA, DLS and -potential, xiii) cytostatic handling, cell culture facilities, cytometry, ex vivo permeation chambers, ix) access to NMR and in vivo facilities.

Project description

Project nº1: Lead halide perovskite solar cells have proven to be one of the most promising photovoltaic devices due to their high absorption coefficients, narrow bandgaps and their easy and low-cost processing, reaching high power conversion efficiencies (PCE) of more than 25%. Alternative halide perovskites are currently being developed: on the one hand, replacing Pb2+ by less toxic metals (e.g. Sn2+, Bi3+) and, on the other hand, increasing their stability by interface engineering strategies. Briefly, within the Marie Skłodowska Curie MSCA fellowship, we propose the design of lead-free perovskites as eco-friendly and robust candidates for solar cells: i) the substitution of toxic lead (Pb2+) by other suitable metals (i.e. Bi3+ or Sn2+); ii) the use of amine-type organic aromatic cations to improve final stability and; iii) the fabrication and characterization of perovskite solar cell prototypes.

Project nº2: Due to the high structural and compositional versatility together with their large porosity, Metal Organic Frameworks (MOFs) are very promising candidates for societal and economically key applications such as fluid separation, capture, sensing, catalysis or biomedicine, among others. More precisely for the energy field, MOFs have been proposed for both H2 purification and storage processes. While these two areas have been extensively studied, more innovative researches have recently proven interesting features of MOFs in the cross-disciplinary fields of clean energy generation via hydrogen production or CO2 reduction, next generation rechargeable batteries and supercapacitors. In this sense, the usual poor electronic conduction of MOFs can limit their performances for energy production and storage purposes.

Providing MOFs with a metallic or semiconducting character might improve their application in the electrochemical energy-storage field, among others.
Briefly, within the Marie Skłodowska Curie MSCA fellowship, we will aim to develop photo/electron conductive MOFs by: i) the intrinsic electrical conductivity of the framework, playing with its structure and composition (synthesis and characterization of new structures), or ii) by adding charges into the MOF porosity through the insertion of different species in preformed MOFs.

Research Area

Chemistry (CHE)

Applications

Deadline for submission of documents **15th of July 2023**.
Documents to be submitted:

- ✓ Complete curriculum vitae stating background and skills
- ✓ Letter of motivation including research interests
- ✓ Two reference letters

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