

CONTRATOS PREDOCTORALES 2021 SEVERO OCHOA

PROJECT TITLE / JOB POSITION TITLE:

Understanding the conversion of heat into electricity using carbon based thermoelectrics

RESEARCH PROJECT / RESEARCH GROUP DESCRIPTION:

(2.000 characters – including spaces)

Heat is ubiquitous: most human activities result in waste heat; sunbathing also raises the temperature; heat can even be found underground... so, how can we harvest this source of energy? Thermoelectrics are solid state devices that precisely do this, transform temperature gradients into electrical power. These devices are based on materials that have a very unusual set of qualities: they transport electricity almost like metals, but heat hardly flows through them as though they were plastics. While already promising, performance is still modest for materials that operate at low/medium temperatures (most waste heat fits there) and using non-toxic, abundant materials such as carbon based. Improving our knowledge on what makes a material a good thermoelectric, or how to control its properties would surely produce a step forwards in this emerging technology.

This position taps into two milestones reached by our group. First, we have developed innovative processing methods to tune the electrical properties of carbon materials [Nature Communications, 11, 3610, 2020]. These methods have been used for the high-throughput evaluation of materials properties, such as optimum efficiency and stability [Macromolecules, 53, 609, 2020]. Secondly, we have discovered a new mechanism to reduce the thermal conductivity of organic semiconductors, which has the potential to really increase performance [ACS Energy letters, 5, 2972, 2020]. The objective of this studentship is to use these tools to further our understanding of carbon based systems towards efficient and stable materials for thermoelectric applications.

The student will join *Capt'n* Mariano and his team of 10-15 chemists, physicists, material scientists and engineers, who row all together in order to contribute to develop more sustainable energy materials for photovoltaics and thermoelectrics. We are part of Nanoopto group, check our web for details on projects, publications, news and activities:

<https://nanopto.icmab.es/>

JOB POSITION DESCRIPTION:

(2.000 characters – including spaces)

Include all the relevant information about the position, role, responsibilities and skills required within the project/group

The **main tasks** that will be undertaken include:

- Fabricate samples with variable molecular orientation, degree of porosity, nanostructuration, doping level, etc. When possible, high-throughput methods will be used in order to be more time and resources efficient, explore larger datasets and be statistically more meaningful.
- Characterize their thermoelectric properties (Seebeck effect, thermal conductivity, electrical conductivity) as well as the stability of the materials upon thermal and/or chemical stress.
- Employ advance spectroscopic tools to investigate materials in depth
- If time allows, introduce artificial intelligence tools to analyze the data.
- The project will involve collaboration with international experts in structural characterization (synchrotron radiation) and different levels of theory.
- We will strongly promote that the candidate makes a research stage in one of the labs with which we often collaborate, such as those in the USA, UK, Sweden or Germany.

Requirements

- To carry out this exciting project, we are looking for an energy and environmentally conscious person who loves understanding the world around him/herself, is passionate about science and enjoys collaboration.
- The fellow should hold a Bachelor degree in Chemistry, Physics, Materials Science or Nanoscience, related engineering disciplines, and hold a recognized Master degree (or equivalent). As this is a fellowship, grades are also important to be selected.
- Some experience in materials processing and/or advanced characterization of materials would be an added value.

Conditions

The contract will be full time.

Gross annual salary in the range of other PhD fellowships from the MICINN.

Duration of 3 years with the possibility of extension.

The successful candidate will work in an international environment together with a dynamic team and will receive a strong multidisciplinary training. Drop me a line if you have questions/interest in coming on board (mcampoy@icmab.es).

GROUP LEADER:

Title: Dr.

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Research project / Research Group website: <https://nanopto.icmab.es/>