Marie-Skłodowska-Curie Actions – Individual Fellowships 2020

ICN2 Expression of Interest

Group leader:

Prof. Dr C.M. Sotomayor Torres

Scientist in charge of the fellow:

Dr Marianna Sledzinska

Contact email:

marianna.sledzinska@icn2.cat

Brief description of the research group:

The Catalan Institute of Nanoscience and Nanotechnology (ICN2) is a research centre with about 200 people among researchers, technical and administrative support staff. The research covers topics in information and communication technologies, health and life sciences and energy, as well as the development of methods for nanofabrication, growth, nano-and microscale characterisation and analysis for nanoelectronics, spintronics, nanophotonics and nanophononics.

The **Photonic and Phononic Nanostructures (P2N) group** is led by Prof. Clivia Sotomayor Torres. The P2N research topics include studies based on phonon and photon confinement, opto-mechanics, nanoscale heat transport and phononic and photonic crystals in semiconductors, 2D materials, organic and oxide nanostructures. The group carries out pioneering in nanophononics, nanofabrication and nanometrology.
The P2N group develops new concepts for multi-state variables based on the engineered interactions of phonons with electrons and photons, in device-like structures. One particular interest is thermal transport in the nanoscale to address heat dissipation in nanoelectronics, the role of phonons in noise and dissipation in nano-scale systems. Our experimental research is anchored in novel nanofabrication methods and defectivity metrology. In our research we use state of the art optical spectroscopy methods and develop new techniques to reach the nanoscale in thermal transport, such as laser Raman thermometry and time/frequency domain thermoreflectance.

Title of project:

Phonons and thermal interfaces in 2D materials characterized by non-contact optical spectroscopies

Project description:

Phonon band structure engineering in two-dimensional (2D) materials has attracted significant attention in the recent years. The main objective of this project is to **study and control the phonon propagation in 2D materials**, such as TMDS and their heterostructures.

The core of the project is the development of high quality, large area monolayers CVD growth and clean transfer methods for homogeneous and heterogeneous 2D materials. Twisted bilayers will serve as a platform for phonon propagation, guiding and lifetime studies.

In the project we will focus on:

(i) Phonon dispersions in homogeneous and heterogeneous 2D materials;
(ii) Role of the edge states;
(iii) Role of interfaces, i.e., inter-layer in stacked materials, intra-layer in polycrystalline materials, and lateral heterogeneous materials in the propagation of phonons;
(iv) In the case of heterogeneous 2D structures, the goal is to study the effect of the interfaces and relative orientation of dissimilar materials stacking on their mechanical and thermal properties.

Phonons in 2D materials will be studies by non-contact methods, such as inelastic light scattering, thermoreflectance and picosecond acoustics to determine the thermal conductivity and phonon lifetimes.

Research area:

Chemistry	CHE	
Social Sciences and Humanities	SOC	
Economic Sciences	ECO	
Information Science and Engineering	ENG	x
Environmental Sciences and Geology	ENV	
Life Sciences	LIF	
Mathematics	MAT	
Physics	PHY	x

ICN2 HR will request a letter of motivation, CV (max. 4 pages) and two referees. Do you have any other application instructions?

A copy of the abstract of the applicant's MSc. dissertation and PhD thesis.