

The Catalan Institute of Nanoscience and Nanotechnology (ICN2), located in Barcelona, Spain, is a non-profit research institute created in 2003 to foster cutting-edge research in nanoscience and nanotechnology. ICN2 is a member of the Barcelona Institute of Science and Technology and the Catalanian network of excellence CERCA. It is one of eighteen Severo Ochoa Centres of Excellence in Spain. It is located at the Bellaterra campus of the University Autonomous of Barcelona in a purpose-designed building with state-of-the-art facilities. ICN2 researchers have access to shared resources, including an in-house small clean room facility, the clean room of the National Centre for Microelectronics (CSIC-CNM) and the ALBA Synchrotron. ICN2 has about 230 full-time researchers including PhD Students, Postdoctoral Researches, Specialized Technicians and Group and Division Leaders. Research is conducted via independent research lines, broadly grouped into two areas 1) Nanophysics, including atomic-scale material studies of fundamental and applied character, theoretical studies, nanoelectronic devices, nanophononics, nanophotonics, NEMS, spintronics and nanofabrication and 2) Nanochemistry and Nanobiochemistry.

Job Title: Postdoctoral Researcher

Research area or group: Phononic and Photonic Nanostructures Group

Description of Group/Project:

Topological bosonics: design and optimization of topological materials

In January 2019 we started a 5-year EU FET-Proactive project on Topological matter in collaboration with the group of Quantum Photonics at the Niels Bohr Institute in Copenhagen and groups working on electronic topological insulators such as the Physics and Engineering of Nanodevices group at ICN2 and the group of Topological Insulators at Würzburg University. Our main goal is to gain a radically new fundamental knowledge of the interactions and correlations between topological excitations (photons, phonons and electrons) in hybrid topological systems for efficient transfer and manipulation of classical and quantum information by a suitable combination of specific materials and structures, e.g. topological insulators and photonic crystals, and by designing device-like structures that host more than one topological quasiparticle



Photonic Topological Materials. A rendered image of a topological waveguide

Main Tasks and responsibilities:

To develop low-loss waveguides based on photonic crystals hosting topological edge states with arbitrary shape. The technology breakthrough will result from the combination of the properties of photonic crystals (on III-V, and Si semiconductors) with unique topological structures for confining and protecting the edge states from localization and scattering with defects and a detailed study of emission, and subsequent propagation, of photons in topologically protected modes.

To develop topological photonic and phononic nanostructures in planar and vertical multilayer structures and use them to advance the fundamental understanding of the interaction between trivial (chiral) quasiparticles with their topologically protected counterparts.

Requeriments:

We are looking for an experienced theorist with background in photonics, phononics and/or optomechanics, preferably expert on analytical tools more than numerical models, and ideally some expertise in group theory. From novel designs of optomechanical crystals, we need to delve into group theory and band-structure engineering to develop low-loss waveguides based on optomechanical crystals hosting topological edge states with arbitrary shape. In particular, we are developing semi-analytical models to treat complex photonic and phononic low-dimensional structures to implement topological properties with topological global properties that are, to a certain extent, immune to small perturbations such as unavoidable fabrication disorder. The candidate will conduct analytical theory combined with simulations using group theory to specifically design and optimize topological waveguides for near-infrared photons and phonons in a wide spectral range from few to 100's of GHz.

Summary of conditions:

- Full time work (37,5h/week)
- Contract Length: two years (with possible extension to a third year)
- Salary will depend on qualifications and demonstrated experience.
- Support to the relocation expenses.
- Life Insurance.

Estimated Incorporation date: January 2021

How to apply:

All applications must be made via the ICN2 web page and include the following:

- A cover letter.
- A full CV including contact details.
- 2 Reference letters or referee contacts.

Deadline:

Informal enquiries regarding the vacancy can be made to Dr. P. David García: david.garcia@icn2.cat and or to Prof. Clivia M. Sotomayor-Torres clivia.sotomayor@icn2.cat.

Equal opportunities:

ICN2 is an equal opportunity employer committed to diversity and inclusion of people with disabilities.