

CONTRATOS PREDOCTORALES 2020 SEVERO OCHOA

PROJECT TITLE / JOB POSITION TITLE:

Highly Luminescent Organic Radical Chiral Nanoparticles (ONPs) for Biomedical Applications

RESEARCH PROJECT / RESEARCH GROUP DESCRIPTION:

(2.000 characters – including spaces)

The project is the continuation of a research developed in the framework of a big collaborative European project. Specifically, the work consists on the design, preparation and characterization of molecular multifunctional materials based on multipolar systems made of organic radicals with tunable polarizabilities for the preparation of organic nanoparticles (ONPs) for bioimaging with good photostability. Structural and optoelectronic characterization of the ONPs will be addressed by appropriate spectroscopic (absorption, emission), microscopic (SEM, TEM) and calorimetric techniques. The ability to process such organic molecules as ONPs is a good strategy in order to confer them the desiderate water stability, to work in biological environments, which is not attained in solution due to the high insolubility of organic molecules in water, thus, becoming promising materials with applications in the area of bioimaging and biomedicine (i.e. for intracellular nanothermometry applications due to its sensitive dependence of emission with temperature). Functionalization of such radical molecules will also bring the opportunity to prepare ONPs with additional magneto-optical properties expanding the possibility to attain therapeutic properties.

Chirality is one of the most fascinating occurrences in the natural world and plays a crucial role in chemistry, biochemistry, pharmacology, and medicine. Chirality has also been envisaged to play an important role in nanotechnology and particularly in nanophotonics, therefore, chiral and chiroptical active nanoparticles (NPs) have attracted a lot of interest over recent years. In the framework of this project, the intrinsic chirality of the synthesized organic radicals and its high racemization barrier upon properly functionalization, will allow to obtain efficient chiral luminescent nanoparticles with potential applications in emerging photonics as circularly polarized luminescent (CPL) magnetic emitters, bioimaging, or in spintronic devices.

Nanomol has a wide expertise and recognized excellence in the synthesis, modeling, processing and study of molecular, supramolecular and polymeric multifunctional materials with chemical, electronic, optical, and biomedical properties. The group also belongs to CIBER-BBN a virtual network of research centers devoted to bioengineering, biomaterials and nanomedicine. Some of the laboratories of *Nanomol* form part of NANBIOSIS. During the last years, the *Nanomol* group has hosted 40 Doctoral Thesis and more than 19 Postdocs, from more than 10 different foreigner countries.

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 offered job position will be framed in the interdisciplinary field of **molecular nanostructured materials with optoelectronic properties for biological applications**.

The candidate will prepare ONPs doped with organic radicals looking for an enhancement of the Luminescence Quantum Yield, the luminescence lifetimes and emission in the biological window (Red/NIR region). The possibility to tune the emission as a function of external inputs such as temperature, Ph, etc... and also on the radical concentration inside the ONP together with the doublet electronic configuration of radicals also open the way to new strategies in the fabrication of sensors (i.e. for nanothermometry) or OLEDs with high Internal Quantum Efficiency. Specifically, the influence on the luminescent properties of new materials presenting open-shell electronic and chiral structures which have a SOMO (Semi-Occupied Molecular Orbital) level will be studied.

Specifically, the work will consist on the design and synthesis of molecular multifunctional materials. Structural and optoelectronic characterization of the nanostructured material will be performed with different methodologies and advanced characterization techniques (IR, XPS, EPR, HPLC, MALDI-TOF, UV-Vis, DLS, TEM, cryo-TEM, ITC, fluorimetry, etc.) available at the ICMAB and at the UAB campus and its final biological evaluation with cells.

Candidates must hold a degree in Chemistry, Nanoscience or Materials Science and a recognized Master degree (or equivalent), both with high qualifications. An interdisciplinary outlook is desired and will be encouraged. Experience in organic synthesis, spectroscopic characterization, nanoscience and cell cultures will be highly valued. We are looking for a collaborative and proactive person, as well as a team player with the ability to work effectively on complex research projects in a multidisciplinary environment with good knowledge of English.

PROJECT LEADERS:

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<http://www.researcherid.com/rid/E-2353-2014>; Imma Ratera (Google Scholar)

Research Group website: www.icmab.es/nanomol

RELATED LINKS TO THE POSITION:

<http://www.ciber-bbn.es/>