

CONTRATOS PREDOCTORALES 2022 SEVERO OCHOA

PROJECT TITLE / JOB POSITION TITLE:

From the design of tetrathiafulvalene-curcuminoid (TTF-CCMoid) systems and the study of their structural-electronic correlation to their testing in devices

JOB POSITION RESEARCH LINE:

RL4 - Tuneable and Low-Cost Molecular Electronics

RESEARCH PROJECT / RESEARCH GROUP DESCRIPTION:

Organic electronics (*OE*s) encompasses next generation materials and molecule-based devices with direct impact on key enabling technologies such as: advanced materials, life science technologies, micro/nanoelectronics and photonics. The use of single molecules, molecular films or assemblies, as active components in electronic devices, is the most powerful approach towards miniaturisation, improved electronics, and new technologies. OLED displays and monitors are successful examples of applied *OE*s. However, despite great achievements, there are still major challenges in the implementation of molecule-based electronics that require (i) the design of new sensitive materials, (ii) the analysis of their structural-electronic correlation and (iii) the use of simple methods for their manipulation and insertion into devices.

Curcuminoids (*CCMoids*) are dyes with versatile chemistry; their linear and conjugated backbones are easy to modify, which makes them excellent molecular platforms, able to coordinate with additional active units (*e.g.*, pyrene, ferrocene, fullerenes, *etc.*). Our group is involved in the study of the single-electron transport properties of *CCMoids*, acting as nanowires, by means of break-junction/mechanically controlled break junction (*BJ/MCBJ*) techniques. In addition, *TTF* derivatives are outstanding building blocks with remarkable redox properties, applied in areas such as logic gates, molecular sensors, and redox-fluorescent switches, among others.

The initial aim of the project is the synthesis and characterisation of *TTF-CCMoid* molecular hybrids, together with the evaluation of their electronic properties, in solution and solid state, and deposition studies on substrates/devices. The ultimate aim is to evaluate the responsiveness of a family of *TTF-CCMoids* and to correlate the electronic response to intra-/intermolecular structural changes of the different systems.

JOB POSITION DESCRIPTION:

The candidate will be trained in organic and coordination synthesis, together with characterization in solution and in the solid state of all TTF-CCMoids systems, including NMR (solution and solid state), electrochemistry, Raman, crystallographic techniques (single X-ray diffraction, XRD). She/he will also be trained in materials deposition techniques (in solution and in vacuum) and therefore in additional techniques such as XPS, TEM and SEM. Finally, those molecules studied in devices will give the student the opportunity to perform electronic characterization (I-V studies) in devices of different formats (e.g., graphene-FETs).

The candidate's work will be monitored by their supervisors in meetings every 15 days and she/he will actively participate in the group meetings, periodically presenting her/his work and carrying it out in English and will participate in the maintenance and organization of the lab space, as the rest of the group.

GROUP LEADER:

Prof. Núria Aliaga-Alcalde and Dr. Arántzazu González-Campo

Email: naliaga@icmab.es / agonzalez@icmab.es

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