CONTRATOS PREDOCTORALES 2021 SEVERO OCHOA

PROJECT TITLE / JOB POSITION TITLE:

Development of immobilized metal-organic assemblies for therapy and imaging

RESEARCH PROJECT / RESEARCH GROUP DESCRIPTION:
(2.000 characters – including spaces)

Nanomedicine offers great opportunities and challenges in therapy, diagnosis, imaging, or and tissue regeneration. However, one of the main challenges in nanobiomedicine is the development of personalized therapies and/or diagnosis. An emerging direction by which to solve this challenge is the development of multi-functional nanomaterials to provide platforms that integrate therapy and diagnostics, namely, theranostics. Many multi-functional materials have been proposed as theranostics such as dendrimers, mesoporous silica nanoparticles, and liposomes. However, porous coordination polymers (PCPs) and Metal-Organic Frameworks (MOFs) have been emerged as alternative materials due to their large surface areas, tunable pore size, tunable surface modification, and good biocompatibility. MOFs consist of assemblies of organic ligands and metal ions via coordination chemistry and have been studied for drug delivery, phototherapies, and synergistic therapies, among others. Regarding MOFs for theranostics, among all the strategies developed, one of the most promising is the combination of a pro-drug as an organic linker together with biocompatible metals (Mg^{2+}, Ca^{2+}, Fe^{3+} and Zn^{2+}) and their growth on surfaces. Towards this end, the main aim of the project is to develop mutlifunctional porous organic frameworks anchored to surfaces using biocompatible curcuminoids (CCMois) and porphyrins (PPs) in order to combine therapy and imaging. Therefore, this project presents several novelties, on the one hand, the preparation of immobilized MOFs based on CCMoids and PPs, the control of their structure and the integration of the imaging response with the chemotherapy into a single system. Finally, in this project the use of supramolecular chemistry will be very important in order to have responsive systems that allow the controlling of the assembled systems and the release of the chemoactive and imaging components.

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 project plan includes the following: (a) the growth and stability of CCMoids and PPs-based MOF on surfaces (Au, SiO2), (b) exploring of the use of stimuli-responsive nanovalves and control of the release of the pro-drug; and (c) to studying the functionality of the bi-functional systems in solution and under physiological conditions. The student will in charge i) design

Campus de la Universitat Autònoma de Barcelona
08193 Bellaterra, Catalunya, Espanya
Telf.: +34 935 801 853
Fax.: +34 935 805 729

and synthesis of new curcuminoid-based building blocks; ii) Controlled growth of the organic frameworks on surface (Au, SiO_2); iii) Study of the properties of the organic frameworks in solution and on surfaces; iv) Studies of encapsulation and release of guest molecules; v) characterization of the new systems in solution by NMR, fluorescence, XRD among others; vi) characterization of the immobilized systems by different techniques such as XRD, SEM, AFM; vii) Study the activity of the frameworks before/after loading different guest molecules. The optimized and well characterized CCMoids-based responsive organic frameworks will be tested as chemical/biological sensors with the collaboration of other groups. The student will work in an international group and the work will be developed with collaboration of national and international groups. The student will acquire knowledge on synthesis and surface chemistry and a wide range of characterization techniques (NMR, XRD, SEM, AFM). The student will participate in national and international conferences presenting the work and will also acquire experience in writing papers and supervising undergraduate students.

GROUP LEADER:

Title: Dr.
Full name: Arántzazu González-Campo
Email: agonzalez@icmab.es
Research project / Research Group website https://funnanosurf.icmab.es/

Campus de la Universitat Autònoma de Barcelona
08193 Bellaterra, Catalunya, Espanya
Telf.: +34 935 801 853
Fax.: +34 935 805 729