INTERNATIONAL POSTDOCTORAL PROGRAMME
CAMPUS VIDA RESEARCH CENTERS NETWORK

Eligible Research Lines at CIQUS

The *Center for Research in Biological Chemistry and Molecular Materials* (CIQUS) of the University of Santiago de Compostela offers within this Postdoctoral Programme the following research lines:

Development of stimuli-responsive nanocarriers for "smart" drug delivery

Supervisors: Del Pino González and Montenegro García

Description: The efficient delivery of nanocarriers into the cytoplasmic matrix, circumventing their storage in the phago-/lysosome as viruses do, remains largely elusive. In this line, the project proposed focuses on the development of next generation "smart" nanocarriers with two main capabilities: virus-like dynamic intracellular features and remote control by external electromagnetic fields. To this aim, the groups of Javier Montenegro and Pablo del Pino will form an interdisciplinary hub with complementary expertise. The candidate should have sound experience in colloidal/organic chemistry and bionanointeractions.

External stimuli self-sorting in amphiphilic supramolecular aggregates

Supervisors: García Río

Description: Exchange of solubilized species in micelles/vesicles between the inner core/palisade layer and the Stern layer usually do not occur, but in the case of sulfonatocalixarenes based micelles the guest can, in principle, exchange between the cavity and the other solubilisation sites (Chem. Eur. J. 2016, 22, 6466-6470). This particular property allow the study of molecular recognition and self-sorting events within the micellar aggregates where local concentrations can be exceptionally high and the active species are compartmentalized in specific locations.

Dendritic micelles and nanoparticles for theranostic applications

Supervisors: Fernández Megía

Description: Our group exploits the globular nature of dendrimers in the construction of supramolecularly assembled micelles and nanoparticles for the encapsulation of low molecular weight drugs and therapeutic proteins. The monodispersity and rigidity of dendrimers translate into nanosystems with superior stability under physiological conditions, and size, biodistribution and pharmacokinetics that can be tuned by dendrimer generation. With this objective, our laboratory designs dendrimers functionalized with chemical "handles" to maximize drug encapsulation and the stability of the nanosystems.

Targeting LpxC enzyme in Gram-negative bacteria for antibiotic drug discovery

Supervisors: González Bello

Description: The aim of this proposal is to address key pathogens causing major antibiotic drug resistance concerns through a multidisciplinary approach to promote basic research forward to clinic. By a combination of chemical, structural and computational tools, the inhibition of the clinically unexplored and promising LpxC enzyme, which is involved in the lipid A biosynthesis and whose inhibition recently demonstrated to protect mice from resistant ESKAPE pathogens, will be studied. Preferred candidate profile: chemist.

Environmental sensitive fluorescent probes for cellular uptake signalling

Supervisors: Granja Guillán and Montenegro García

Description: Most of the standard fluorescent probes are insensitive to their local environment, cell penetrating peptide (CPPs) are invisible to microscopy and following fluorescent peptides in membranes and cell assays is difficult due to their dynamic character. Therefore, we propose to develop dynamic sensitive fluorescent probes. These probes will illuminate the uptake with mechanosensitive properties that will change with the local environment and they will be used as dynamic tracers of the peptide internalization pathway. This project will be carried out within the framework of ERC-StG DYNAP.

Design and synthesis of novel nanographenes: from molecules to devices

Supervisors: Guitián Rivera, Pérez Meirás and Peña Gil

Description: The candidate will have the opportunity to work in one of the projects currently ongoing in our labs. The first one exploits the chemistry of arynes for the construction of nanographenes and other extended, functional PAHs with application in molecular electronics. A second one, which is developed in tight collaboration with surface physicists, is aimed to study single molecule chemistry and on-surface synthesis, including structurally defined graphene nanoribbons with tailored electronic properties.

New perspectives in metal catalysis. Catalysis in biological media

Supervisors: Mascareñas Cid

Description: The candidate would work in interdisciplinary projects at the frontier between coordination and organometallic chemistry, catalysis and chemical biology. In particular we aim at discovering and developing new catalytic transformations of synthetic potential as well as explore the viability of achieving efficient metal-catalyzed transformations in complex biological environments. The candidate should have strong experience in synthesis and organometallic chemistry and basic knowledge in biochemistry and chemical biology.

Block-copolymers for bulk heterojunction solar cells

Supervisors: Massimo Lazzari and Rivadulla Fernández

Description: The need of renewable and affordable energy sources boosted the research and development of solar cells with improved efficiency. The goal is to explore the possibility of using block-copolymers as a photoactive material in a new generation of hybrid bulk heterojunction solar cells (BHJ solar cells). Different compositions and block-architectures will be explored for optimizing the acceptor-donor configuration and effective charge transport to the electrodes. Professors Lazzari and Rivadulla will promote this interdisciplinary research line. Experience in materials chemistry, polymer synthesis and electrical transport measurements will be highly considered.

Helical Polymers: Sensors and nanostructures.

Supervisors: Riguera Vega, Quiñoá Cabana and Freire Iribarne

Description: The target goal of this interdisciplinary research is the design, synthesis and evaluation of smart polymers and nanostructures with stimuli-responsive properties. More precisely: the generation of size- and helically-controlled nanostructures from helical polymers and their applications for reversible chiral recognition; Asymmetric catalysis and processes related to their helicity such as optical sensors. Required experience: Organic and supramolecular chemistry, asymmetric synthesis and catalysis, smart polymers, nanoaggregates and solid state techniques.

Organometallic Catalysis: Development of new catalytic reactions

Supervisors: Fañanás Mastral, Saá Rodríguez and Varela Carrete

Description: Our research is dedicated to the elaboration and application of new catalytic methods in organic chemistry in order to facilitate new and efficient synthetic ways to organic molecules, specifically, in the synthesis of natural and synthetic bioactive products and in new organic materials. In particular, the candidate will work on the development of new transformations based on C-H activation processes and enantioselective bimetallic catalysis. A strong background in organometallic catalysis and/or synthetic organic chemistry is highly recommended.

Santiago de Compostela, July 14th, 2016