

Doctoral Training Programme in Functional Advanced Materials (DOC-FAM)

DocFam+ (DOctoral training programme in Functional Advanced Materials: Towards a Better Future) is a new doctoral programme for the recruitment of 26 excellent doctoral researchers led by the Institute of Materials Science of Barcelona (ICMAB-CSIC).

DocFam+ is a unique interdisciplinary and intersectorial research programme. We offer excellent salaries and international experience through secondments. The complete training programme includes annual workshops, a career development retreat and industry days, among others.

More information: <https://docfam.icmab.es/>

Job Title: PhD Student - Engineering flexible, conformable substrates for monitoring and treatment of brain disease

Description of the project/group:

Engineering of flexible substrates for acute and chronic implantation in surface (epicortical) or deep (subcortical) locations in the brain is a design principle for neural interfaces that aims to maximize adherence with uneven tissue architectures and minimize tissue response. This research project is truly multidisciplinary and will require new knowledge generation in materials engineering for the fabrication of flexible, soft substrates and their implantation using *in vivo* disease models established in the Nanomedicine Lab. All of the expertise, infrastructure and instrumentation within the Nanomedicine Lab and the Advanced Electronic Materials & Devices Group at ICN2 will become available to the Doctoral student for the development of the project. Furthermore, training and strong interaction with collaborating scientists and laboratories of diverse expertise (e.g. microfabrication, *in vivo* disease modelling, pathophysiology) will be greatly encouraged.

The aim of the Nanomedicine Lab is the development of novel, safe and effective therapeutics based on nanoscale components and their combinations, used as either the 'drug' or the 'transport system'. Such components include DNA, RNA, viruses, radionuclides, liposomes, graphene, 2D-heterostructures, carbon nanotubes and other nanomaterials (quantum dots, metallic nanoparticles). All research efforts aim to bridge the gap between fundamental nanomaterial engineering and medicines development towards the realisation of advanced therapeutic modalities.

The Advanced Electronic Materials and Devices Group at ICN2 aims to explore fundamental electronic and electrochemical phenomena of novel materials, with a current particular emphasis on graphene and other 2D materials (e.g. MoS₂), and to develop the fabrication and processing technologies necessary to prepare advanced electronic devices and systems based on them. A major focus of our work are applications related to neural interfaces and neuroelectronics.

Principal responsibilities:

The Doctoral student will contribute to the scientific programme in neural interface engineering developed by the Nanomedicine Lab. The research will involve primarily laboratory experimental work around the fabrication and use of components or complete neural interface devices. The Doctoral candidate will be expected to undergo full training in all techniques and protocols to be used, in a collaborative effort between the Nanomedicine Lab and the Advanced Electronic Materials

& Devices Group at ICN2. Meticulous record keeping and a high level of consistency is also key for this position.

- Thorough interaction with the PI and other members of the Nanomedicine Lab to assist to the development, progression and execution of the research project;
- Synthesis, fabrication and characterisation of various flexible and conformable substrates aimed ultimately for clinical use;
- Use a range of physicochemical and materials characterisation techniques (Raman, AFM, SEM, TGA, laser light scattering, spectrophotometry, electron microscopy, ICP-MS, XPS)
- Application and use of the fabricated devices using *in vivo* disease models (following training and supervision by experienced *in vivo* experimentalists);
- Execution of experiments using different core facilities across the UAB and ALBA campuses and collaborating institutions (e.g. University of Manchester, UK);
- Consistent evaluation of the bibliography in the areas relevant to the research;
- Development of communication and scientific writing skills;
- Contribution to the workings, team work and activities of the Nanomedicine Lab overall.

Education:

Undergraduate or Master's Degree in chemistry, chemical engineering, materials science, bioengineering, nanoscience and nanotechnology or equivalent.

Experience:

- Demonstrable previous basic use of some physicochemical and materials characterisation tools (e.g. Raman, AFM, laser light scattering, spectrophotometry, electron microscopy, ICP-MS, XPS).
- Experience in procurement/reception of consumables

Competences:

- Methodological skills relevant to the research theme.
- Excellent organizational and time-management skills, including the ability to deliver timely and high-quality outputs.
- Ability to plan, organize, and undertake work without detailed supervision.
- Ability to develop effective working relationships with all levels of staff and students.
- Ability to work under pressure and maintain a high degree of accuracy.
- Ability to work effectively in a multi-disciplinary team.
- Ability and enthusiasm to learn new skills outside own discipline.

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