

## POSTDOCTORAL RESEARCHER - NANOSTRUCTURED FUNCTIONAL MATERIALS GROUP

The mission of the Catalan Institute of Nanoscience and Nanotechnology (ICN2) is to achieve the highest level of scientific and technological excellence in Nanoscience and Nanotechnology. Its research lines focus on the newly-discovered physical and chemical properties that arise from the behavior of matter at the nanoscale. ICN2 has been awarded with the Severo Ochoa Centre of Excellence distinction for two consecutive periods (2014-2018 and 2018-2022). ICN2 comprises 19 research groups, 7 technical development and support units and facilities, and 2 research platforms, covering different areas of nanoscience and nanotechnology.

**Job Title:** Postdoctoral Researcher

**Research area or group:** Nanostructured Functional Materials group

### Description of Group

The Nanostructured Functional Materials group (**Nanosfun**, [www.nanosfun.com](http://www.nanosfun.com)) is a research group at the Catalan Institute of Nanoscience and Nanotechnology (ICN2, [www.icn2.cat](http://www.icn2.cat), Barcelona, Spain). **Nanosfun** is aimed to develop novel (supra)molecular and polymeric functional nanomaterials with application in **Health** and **Environment**. Specifically, one of our main research lines is the design and fabrication of nanomaterials for **tissue regeneration**, which has become one of the main branches of medicine aiming to solve a multitude of pathologies caused by irreversible tissue degeneration. Nowadays, there is a blooming of interest with several international initiatives in the area as well as several scientific publications. However, in many cases, their transfer to the clinic is hampered (high cost of production, toxicity and low regenerative activity). For this reason, the development of new materials with **outstanding features** is a pressing concern. In this scenario, **bioinspired materials** have emerged as potential candidates. Specifically, materials based on **catechol** molecules, present in various living organisms (e.g., mussels), have demonstrated unprecedented adhesive properties under wet conditions, biocompatibility, low toxicity and low cost/scalable processes. These excellent features turn bioinspired catechol-based materials unique for their use in tissue regeneration.

### Description of research project

**Research area:** Medicine, Health, Chemistry, Materials

**Project:** Mussel-inspired membranes as artificial skin (MIaSkin)

Nowadays, when a severe injury occurs in the skin, its primary treatment consists on implementing skin grafts that help the regeneration of the affected area. However, several drawbacks are associated, such as i) the graft does not correctly adhere, ending up necrotizing, ii) the regeneration is not complete, and iii) the resulting skin does not have sensory capacity (e.g., touch sensibility, temperature and humidity regulation). In the market, there are some innovative solutions based on natural (e.g., collagen) and synthetic (e.g., nylon) scaffolds. However, many concerns have been associated to these materials, for example, regulatory barriers on the use of natural products (e.g., collagen) or the non-absorption of the scaffold causing its removal. In many of these cases, the

outcome is the same: the product has to be withdrawn from the market. In this scenario, the design of materials capable of efficiently promoting the regeneration of damaged tissue is of high-priority. A promising alternative is presented by those materials bioinspired by Nature. In this sense, mussel-inspired materials are of high value, showing strong adhesion in water environments, where the secretion of proteins containing catechol and polyphenol moieties play an essential role. This feature has been used by the Nanostructured Functional Materials group to develop catechol-based membranes as ready-to-use platforms that can be easily implemented in different tissues. With this project, we aim to validate our product in preclinical studies for skin regeneration. The Postdoctoral researcher will execute this Project and will be actively involved in exploring functionalization with active molecules and *in vitro* and *in vivo* validation of the resulting materials. **Nanosfun** is investing many efforts in establishing a network with different research groups and hospitals. Among others, **Nanosfun** collaborates closely with the *Neuroscience Institute* (INc-UAB), *Institute of Biotechnology and Biomedicine* (IBB-UAB) and the Veterinary Faculty of the UAB with strong expertise in different biomedical areas. At the hospital level, collaboration has been established with the University of Medicine of Vienna, Sant Joan de Deu, Vall d'Hebron and Bellvitge hospitals, among others.

The MlaSkin project belongs to the grant 2021 INNOV00049 under the framework of Innovadors program with the support of the Department of Research and Universities from the Generalitat de Catalunya.



#### **Main Tasks and responsibilities:**

The Postdoctoral researcher will contribute to the scientific programme and management of the Tissue Regeneration research line. The work will involve the synthesis, modification, characterization and validation of catechol-based membranes for tissue regeneration. Special emphasis will be applied to the **study of the interaction with different biological entities, cells and tissues to assess its preclinical and clinical viability**. The Postdoctoral researcher should be able to perform such experimental work alone or in collaboration with partner laboratories to validate catechol-based materials with demonstrated biocompatibility and offering added functionalities. Expert use of *in vitro* characterization techniques and procedures with different cell lines will be essential to determine the mechanisms and impact of the interaction between the developed materials and cellular models and *in vivo* tissues.

#### **Principal responsibilities:**

- Through interaction with the PI and other members of the **Nanosfun** Group to contribute proactively to the development, progression and execution of the project.
- Synthesis and functionalization various catechol-based materials.
- Covalent and non-covalent functionalization with biologically active molecules (small molecules, proteins, peptides, etc.).

- *In vitro* and *in vivo* assays using different cell lines and animal models to validate the efficiency of the developed materials.
- Execution of experiments using different core facilities at the Campus UAB and collaborating institutions.
- Training on entrepreneurial and tech transfer skills.
- Contribution to the scientific management of the collaborative project (authoring periodic reports, presentations in meetings, participation in congresses, publication of articles) that will require overseas travel.

## Requirements:

- **Education:**
  - PhD in biology, biochemistry or materials science.
- **Professional Experience:**
  - Previous hands-on research experience in handling and studying the biological investigation of materials with biological matter (proteins, cells, tissues).
  - Experience in *in vitro* assays specially focussed on regeneration studies.
  - Experience in culturing mammalian cells.
  - Experience with extraction and culture of primary cells and their culturing protocols.
  - Experience in *in vivo* studies.
  - Excellent research and methodological skills relevant to the research topic.
- **Competences required:**
  - Entrepreneurial interest on tech transfer technologies.
  - Excellent organizational and time-management skills, including the ability to deliver timely and high-quality outputs.
  - Ability to demonstrate scientific writing and communication skills in English.
  - Ability to be creative in research ideas to develop/progress the research area.
  - Ability to develop effective working relationships with all levels of staff, students and external contacts.
  - Ability to work effectively in a multidisciplinary team.
  - Ability to work independently, use own initiative, where appropriate, and be proactive in approach to work.
- **Desirable:**
  - Experience in the chemical synthesis and modification of organic materials.
  - Experience in use of an array of physicochemical and materials characterization tools (DLS, spectrophotometry, electron, optical and fluorescence microscopy, HPLC).
  - Previous experience of applying for research funding.
  - Experience in supervising student research projects.

- Evidence of a developing track record in publishing and disseminating high-quality publications in peer-reviewed journals.

**Summary of conditions:**

- Full time work (37,5h/week)
- Contract Length: 18 months
- Location: Bellaterra (Barcelona)
- Salary will depend on qualifications and demonstrated experience.
- Support to the relocation issues.
- Life Insurance.

**Estimated Incorporation date:** December 2022

**Specific requirements:**

- Candidates must be in possession of their PhD at call deadline

**How to apply**

All applications must be made via the ICN2 website and include the following:

1. A cover letter.
2. A full CV including contact details.
3. 2 Reference letters or referee contacts.

Deadline for applications: 25 November 2022

**Equal opportunities:**

ICN2 is an equal opportunity employer committed to diversity and inclusion of people with disabilities.

ICN2 is following the procedure for contract of people with disabilities according with article 59 of the Royal Decree 1/2015, of 30 of October.