

## **Title of the project: Development of diagnostic systems for a retinal disease (Ret-SCAN)**

### **General objective**

The main global objective of the project is to develop tools to achieve early diagnosis of inflammatory ocular diseases from two different perspectives, namely:

- (i) the acquisition of temperature variations in the eye by a technology known as luminescence nanothermometry with nanoparticles, and
- (ii) the implementation of a graphene-based aptasensor (a Solution-Gated Graphene Field Effect Transistors, g-SGFET) to detect an inflammatory marker.

### **Specific objectives**

1. To achieve proof of concept through *in vivo* experiments by luminescence nanothermometry. Near infrared (NIR) imaging, NIR emission spectroscopy, and optical coherence tomography (OCT) will be used as regular tools and performed both, at the Materials Science Institute of Madrid (ICMM) and at Universidad Autónoma de Madrid (UAM).

4. To validate g-SGFET aptameric sensors for an inflammatory marker. Sensor preparation and electrical characterization will be at the core of this specific objective (performed at ICMM). Ion beam analysis of samples at Centro de Micro-Análisis de Materiales (CMAM) is also part of the tasks to fulfil this specific objective. CMAM is a “*Infraestructura Científico-Técnica Singular (ICTS)*”, located at the UAM Campus (Cantoblanco).

Although the project involves multiple disciplines, such as materials chemistry, cell biology, and animal experimentation, these specific objectives are framed within the context of physics, particularly electronics and optics.

### **Research teams**

*At ICMM:* 2D Foundry <https://sites.google.com/view/2dfoundry>

Main researchers involved: Beatriz H. Juárez, Mar García Hernández and Federico Mompean

*At UAM:* Nanomaterials for Bioimaging Group (nanoBIG)

<https://www.nanobig.eu/>

Main researchers involved: Emma Martín Rodríguez and Nuria Fernández Monsalve

*At CMAM*

<https://www.cmam.uam.es/es/instalaciones/acelerador/>

Main researchers involved: Maria Dolores Ynsa and Miguel Manso Silván

### **Material and equipment resources**

*At ICMM:* Team members will have access to chemistry labs for materials preparation as well as spectroscopy and state-of-the-art labs for device characterization.

*At UAM:* state of the art equipment for advanced optical characterization.

*At CMAM:* As ICTS, team members will have unique opportunity to work in a singular infrastructure.

### **Training program:**

The PhD student will join the 2D Foundry research group at ICMM-CSIC and enroll in the Doctorate Program in Advanced Materials and Nanotechnology at UAM. Regular characterization work will be conducted at both ICMM-CSIC and UAM groups, which are known for their dynamic and multidisciplinary environments. These groups also emphasize transversal skills and outreach activities. The program includes opportunities for international collaborations, as well as the possibility of conducting short-term research at prestigious institutions abroad.