

PhD offer: “DNA assembly of gold quantum clusters superstructures for biosensing and bioimaging ”

Description of the project:

In the AROMA project funded by University Grenoble Alpes (ANR-17-EURE-0003), we aim to rationally design new superstructures composed of DNA and gold quantum nanoclusters to generate highly sensitive biosensors.

DNA nanotechnology offers a great perspective to design sophisticated multi-dimensional nanostructures with original physical, chemical and biological properties for biomedical applications. In the same time, we assist to the emergence of new class of atomically precise ultra-small particles called Gold Quantum Clusters (GQCs) which show unique optical properties highly sensitive to the environment that can be employed as optical transducers for biosensing applications.

In the present project, we plan to build one-, two- and three-dimensional DNA assemblies with ultra-small GQCs emitters to generate new original biophotonic functionalized nanostructures. After full optimization, these nanostructures will be used for two distinct applications : i) as biosensors to detect thrombin in physiological fluids with enhanced sensitivity and selectivity, ii) monitor accurately in cancer cells the reactive oxygen species induced by the presence of GQCs for future cancer therapy.

This work will also answer fundamental questions related to the photoluminescence properties of GQCs when they are precisely assembled with the DNA and to determine the stability and the cellular behaviour (toxicity, subcellular localization) of these new biophotonic nanostructures.

This project will take place in Grenoble at the Institute for Advanced Biosciences (IAB) (CNRS/INSERM/University of Grenoble) located in the hospital pole and at “Molecular Systems & NanoMaterials for Energy and Health” lab. (SyMMES/UMR5819 CEA-CNRS-UGA) located in CEA.

During this PhD, the candidate will first design and characterize new atomically precise noble gold quantum clusters (GQCs) with controlled surface organization and functionalization at IAB. The high potential of these nanoproboscopes for bioimaging was demonstrated recently by our team (Nanoscale **2019**, *11*, 12092; ACS Nano **2020**, *14*, 4973; ChemComm **2022**, *58*, 2967). Then she/he will evaluate the combination/structuration of GQCs with DNA of different geometry and functionalisation in terms of morphology and optical properties at SyMMES before to evaluate the sensitivity of detection in solution and in cellular environment.

Duration: 3 years **Starting date:** October/November 2022 **Location:** Grenoble, France

Project supervisors:

Dr Xavier Le Guével from the Institute of Advanced Biosciences (<https://iab.univ-grenoble-alpes.fr/>)

Dr. Didier Gasparutto from CREAB / SyMMES / IRIG at CEA (<https://www.symmes.fr>) & (<https://www.symmes.fr/Pages/CREAB/Biomade.aspx>)

Applicant profile:

Applicants should hold a Master of Sciences in Chemistry, Physics or Biotechnology Sciences with some knowledge in material chemistry, biomolecular engineering and spectroscopy. Skills in bioimaging are not mandatory. He/she should have a strong interest in working in a cross-disciplinary environment at chemistry-biology interface with biologists and chemists. Good english level is required.

Application:

Candidates should send a Cover Letter, a CV, recommendation letters, and grade transcripts, only by email to xavier.le-guevel@univ-grenoble-alpes.fr and to didier.gasparutto@cea.fr

Deadline: June 1st 2022. An interview should be organized in the second half of June 2022 for this PhD position