

Surface functionalization and characterization for surface plasmon resonance-based sensing

**Call for postdoc for Project MonBone  
(Manutech-SLEIGHT Graduate School funding)**

The ideal candidate will have a PhD in Chemistry/Materials Science, or related disciplines with a strong academic background and publication record. The candidate must have experience in surface functionalization and characterization. Experience with microfluidics is a plus. The candidate will have the responsibility to functionalize, and characterize sensing platforms. She/he will develop specific functionalization protocols to detect key target analytes. Integration of the sensing platform within the perfusion system will be required for the sensing protocols to be optimised accordingly.

This is a multidisciplinary project and the successful candidate should be willing to and capable of interacting with team members from disciplines ranging from cell biology to chemistry to physics. The candidate will also be expected to disseminate results to the broader scientific community, thus having experience with written and oral presentation skill sets.

**Starting date:** flexible

**Yearly gross salary:** 32000 Euro

**Place:** Saint-Etienne, France

**Contacts:** if you have questions and want to know more about this, do reach out to Donata IANDOLO and/or Yves JOURLIN.

An *in vitro* 3D model of bone based on a perfusion culture chamber has been developed and patented within the SAINBIOSE laboratory. The adoption of nondestructive live-monitoring techniques will shrink the analysis time compared to traditional techniques and reduce the need for large sample sizes to achieve statistically significant results in longitudinal studies. **Microsensor systems** are already in use to monitor parameters such as O<sub>2</sub>, pH, glucose, and lactate.<sup>(2,3)</sup> Live-monitoring of **specific cell biomarkers** would provide unique insights into cellular processes and interactions within the dynamic mechanical and chemical environment, by targeting multiple cell types (i.e., osteoblast, osteocyte, osteoclast) and processes. **Biosensors** are analytical devices incorporating a biological component associated with a physicochemical transducer, lend themselves to this aim. Organic electrochemical transistor (**OECT**) and Surface Plasmon Resonance (**SPR**)-based sensors are two powerful examples of biosensing approaches with complementary properties.

Within the BONUS project, a project funded by the European Space Agency to achieve an integrated platform to be used as 3D bone model, OECT-based sensors targeting RANKL and sclerostin, two proteins secreted by osteoblasts and osteocytes respectively, are under development in collaboration with the University of Cambridge.

With the **MonBone** project (**Sainbiose and Hubert Curien laboratories, Saint-Etienne**), we aim to develop SPR-based sensors targeting the same two biomarkers. The aim is to compare the performances obtained with the two technologies and to evaluate their possible complementarity and integrability.

An SPR-based device has been developed by the team led by Yves Jourlin at the Hubert Curien laboratory. Within the MonBone project, we aim to develop strategies to functionalize the gold surface of the SPR-based devices to achieve high selectivity, sensitivity and specificity. Together with the **laboratory MATEIS (Lyon)**, surface functionalization strategies will be explored to optimize sensitivity and selectivity via the Biacore technology here available. This technological approach will allow us to

evaluate the efficacy of the functionalization strategies to graft the capture molecules (e.g., antibody, aptamer) on the gold surface, by quantifying the amount of immobilized capture molecules on the chip surface. Selected functionalization methods will then be used to functionalize the surfaces developed within the Hubert Curien laboratory.

The sensors will be analyzed for their specificity and selectivity for the target biomarkers using recombinant target proteins. The sensing platforms will be integrated within a microfluidic chip and they will be validated for their performances using complex media (Sainbiose Lab). In the long term, they will also be integrated downstream to the culture chamber to achieve continuous online monitoring of RANKL and sclerostin, the two target biomarkers secreted by the cells undergoing osteogenic differentiation in the bone on a chip under development.

The candidate should be dynamic and motivated with a background in **Materials science** or **Chemistry** to contribute to this project by developing and optimizing functionalization strategies.

What would your responsibilities include?

- Functionalization of capture molecules specific for RANKL and sclerostin on gold surfaces that will be used for SPR-based sensing,
- Characterization of the functionalized surface,
- Evaluation of sensor selectivity, sensitivity and specificity.

The efficacy of the established methods will be assessed using different techniques (e.g., water contact angle, AFM, QCM, Biacore) available in the different laboratories collaborating to this project. Also, the performances of the obtained devices will be compared to standard methods such as ELISA kits.

## Key duties and responsibilities

<b>1. Fabrication and functionalization of sensors for specific sensing of cytokines released by stem cells undergoing osteogenic differentiation.</b>	<b>60%</b>
The role holder will collaborate with colleagues within the Sainbiose Laboratory (Saint-Etienne, FR), and Hubert Curien Laboratory (Saint-Etienne, FR), and Mateis (Lyon, FR) to develop functionalization strategies for the optimization of sensor specificity and selectivity. The candidate will work on the optimization of sensor operating conditions and will focus on integrating the developed platforms with the perfusion system. Significant amounts of time will be spent working on the functionalization and characterization of the devices. Excellent writing and presentation skills are required, along with the ability to develop and drive research objectives.	
<b>2. Management</b>	<b>20%</b>
Developing and driving research objectives, ensuring delivery to meet the collaboration objectives & timelines & delivering seminars and occasional talks. Good communication skills and ability to manage their own and others work is essential. The post holder will need to work as part of a team and be responsible for managing their own work. The ability to work independently towards collaboration objectives and timelines, coupled with excellent organisational and problem-solving skills is essential for this role.	

<b>3. Writing / Publications</b>	<b>20%</b>
The role holder will be expected to interact with internal and external collaborators writing up work for presentation and publication, delivering documents, presentations, seminars and occasional talks when required. Publishing papers on the research project, generating new IP, collaborating with and regular reporting to industrial partners and presenting results at national and international conferences.	

#### Person Profile

This section details the knowledge, skills and experience we require for the role.

<b>Education &amp; qualifications</b>	PhD (or close to completing) in Chemistry, Materials Science, Biomedical Engineering or a related field.
<b>Specialist knowledge &amp; skills</b>	<p>Strong experience in surface biofunctionalization and characterisation techniques (light microscopy, contact angle, biochemical assays),</p> <p>Experience in microfluidics fabrication is a plus</p> <p>Prior experience with AFM is a plus</p> <p>Knowledge of Surface plasmonic resonance-based devices is a plus</p> <p>Ability to work as part of a multi-disciplinary team.</p>
<b>Interpersonal &amp; communication skills</b>	<p>Self-motivated to achieve research objectives.</p> <p>Good command of English, and excellent written and oral communication skills.</p> <p>Ability to work closely with interdisciplinary teams of researchers and commercial sponsors. Excellent presentation, organisational and problem-solving skills.</p> <p>A self-starter, with a proactive approach to problem solving &amp; ability to work under pressure to stringent external deadlines within a fast-paced environment is desired.</p>
<b>Additional requirements</b>	<p>To demonstrate ability to write reports, present results, work to deadlines and contribute to academic papers.</p> <p>A high level of accuracy and attention to detail.</p>

## Terms and Conditions

<b>Location</b>	Sainbiose Laboratory, INSERM, University Jean Monnet, Ecole des Mines de Saint-Etienne (Saint-Etienne, FR) and Lab. Hubert Curien CNRS 5516
<b>Working pattern</b>	Monday - Friday
<b>Hours of work</b>	There are no conditions relating to hours and times of work but you are expected to work such hours and days as are reasonably necessary for the proper performance of your duties. Your times of work should be agreed between you and your head of institution.
<b>Administrative condition</b>	The candidate must have defended his/her thesis for at most 3 years
<b>Length of appointment</b>	Limit of Tenure: 12 months due to Limited Funding
<b>Further information</b>	For an informal discussion about the post, please contact Dr Donata IANDOLO: <a href="mailto:donata.iandolo@univ-st-etienne.fr">donata.iandolo@univ-st-etienne.fr</a> , Dr Yves Jourlin: <a href="mailto:yves.jourlin@univ-st-etienne.fr">yves.jourlin@univ-st-etienne.fr</a>
<b>How to apply</b>	Applicants should provide a CV, including contact details of three references and a covering letter describing their suitability for the role.