

Open position for doctoral student

(PhD thesis from 10/2021 to 09/2024)

Lieu de travail / Place:

Rouen Normandie (Mt St Aignan) - France (www.nanofret.com)

Intitulé du sujet / Title:

PhD thesis in lanthanide-to-quantum dot energy transfer for advanced biosensing and live-cell imaging (www.nanofret.com)

Champs scientifiques / Scientific Fields:

Chimie, Nanotechnologie, Biotechnologie, Physique

Mots clés / keywords:

fluorescence, FRET, biosensing, nanomaterials, lanthanides, spectroscopy, imaging, diagnostics

Description du sujet / Project description:

The PhD project at the University of Rouen Normandy (COBRA Lab - team of Niko Hildebrandt) will be implemented in a collaborative research project with the U.S. Naval Research Laboratory (USA, team of Igor L. Medintz). The project will investigate Förster resonance energy transfer (FRET) between supramolecular lanthanide complexes and semiconductor nanoparticles (quantum dots) for multiplexed biodetection and imaging of live cells. Biocompatible FRET nanohybrids will be constructed by self-assembly of proteins, peptides or nucleic acids on the surface of quantum dots. Lanthanide complexes labeled on these biomolecules will be FRET donors to quantum dot acceptors to provide long-lived multiplexed photoluminescence. The project will set up two biodetection applications with these FRET nanohybrids. The first will study the interaction of enzymes and substrates in solution and at the surface of quantum dots to better understand the role of nanosurfaces in improving the specific reactive efficiency of enzymes. The second application will detect calcium inside living cells using genetically encoded FRET sensors with the goal of establishing FRET nanosensors with significantly improved brightness and stabilities compared to existing sensors to date.

The application of surface biochemistry to design biocompatible FRET nanohybrids that will be applied to the detection of enzymes and calcium in solution and in live cells presents an interdisciplinary program with a high potential to obtain important results in the fields of chemistry, nanotechnology, biochemistry and medical bioanalysis. The results will have a significant impact on biomolecular research and diagnostics and can be used to improve industrial processes such as biodegradation of toxic compounds or chemical biosynthesis.

We seek highly-motivated and talented students to investigate functional bioconjugation of different nanoparticle systems and their characterization and application into advanced biosensing and bioimaging based on Förster Resonance Energy Transfer (FRET) spectroscopy and microscopy. Please note that this project is related to nanoanalytical / nanobioanalytical chemistry with only very minor (or no) relation to organic chemistry or organic synthesis.

Prise de fonction / starting date: October 2021

Nature du financement / funding:

Financement public/privé

PhD thesis funded by Labex Synorg, Région Normandie, XL-Chem Graduate School



Présentation établissement et labo d'accueil / Laboratory and institution:

The COBRA (Chimie Organique, Bioorganique, Réactivité et Analyse) laboratory is a mixed research unit (UMR-6014) combining the University of Rouen Normandy, CNRS, and INSA Rouen. One of the major assets of the laboratory are its research activities in both Organic Synthesis and Analytical Chemistry. It has exceptional technical support facilities with state of the art equipment for the latest innovative methods.

The nanoFRET group (nanofret.com) is a young interdisciplinary team comprised of chemists, physicists, and biochemists who are joining their expertises to create and develop novel biosensing technologies and integrate these into real-life bioapplications in cooperation with other academic groups and industrial partners. Our main focus is the application of Förster Resonance Energy Transfer (FRET) with lanthanide complexes, lanthanide nanoparticles, quantum dot nanocrystals, and organic dyes. Using time-resolved and time-gated optical spectroscopy and imaging technologies, we fully exploit the unique advantages of these luminescent markers for ultra-sensitive multiplexed detection, e.g., for in vitro diagnostics or live cell investigations.

Intitulé du doctorat / PhD title: Doctorat de Chimie, PhD in Chemistry

Etablissement / University: Université de Rouen Normandie, France

Ecole doctorale / Graduate School: Ecole Doctorale (508) Normande de Chimie

Profil du candidat / Profile of the candidate:

Applicants should hold a Master of Sciences in Chemistry, Physics, or Life Sciences, with knowledge, skills, and strong interest in analytical chemistry, fluorescence, optical spectroscopy, imaging, biosensing, and nanotechnology. They should have a strong motivation to working in an international and cross-disciplinary environment at the interface of chemistry, biology, and nanoscience and a strong motivation for pursuing a PhD project in applied biosensing spectroscopy and imaging. Working languages are English and French. Daily communication within the research group is in English. Applications are welcome in both English or French.

Date limite de candidature / Deadline for application: 1st of July, 2021

Please send your application with a motivation letter, a recent CV, and at least two recommendation letters to niko.hildebrandt@univ-rouen.fr.