

Spécialité de Master « Optique, Matière, Plasmas »

Stage de recherche (4 mois minimum, à partir de début mars)

Proposition de stage

Date de la proposition : 23/10/2014

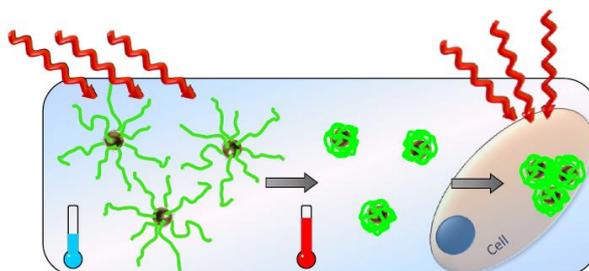
Responsable du stage / internship supervisor	
Nom/name : Palpant Tél : 01 41 13 16 26 Courriel/mail : bruno.palpant@ecp.fr	Prénom/first name : Bruno Fax :
Nom du Laboratoire / Laboratory name : Laboratoire de Photonique Quantique et Moléculaire	
Code d'identification : UMR 8537 Site Internet/web site : http://www.lpqm.ens-cachan.fr/	Organisme : CNRS-ENS Cachan-ECP
Adresse/ address : ENS Cachan, 61 av. du Président Wilson, 94235 Cachan cedex	
Lieu du stage/ Internship place: Ecole Centrale Paris, Grande Voie des Vignes, 92290 Châtenay-Malabry	

Titre du stage / internship title: **Light-heat nanoconversion for biomedical applications**

Background, Context:

Metal nanoparticles under visible electromagnetic radiation are able to act as heat nanoscale sources due to a series of internal energy exchanges. This conversion process can be employed in various fields, particularly for realizing optical, chemical or biological functions. One can then envisage materials or devices whose functionality is only activated and controlled by light. The internship will be devoted to the investigation of hybrid nano-objects consisting of gold nanoparticles functionalized with thermosensitive polymer chains (figure). These nanoparticles will further be used for biomedical purposes: photo-induced targeting of cancer cells and destruction of tumours by hyperthermia. This represents a major issue in the domain of health.

Our team leads a multidisciplinary project involving together physicists, heat transfer specialists, chemists, biophysicists, biologists and medical doctors from different laboratories in Paris region. This project is financially supported by the French National Research Agency (ANR) and the Region Ile-de-France.



Objectives and issues

The goal of the master internship is:

- to finalize a pedagogical demonstrator intended to illustrate the principles of the project for the general public. This will be presented in **Palais de la Découverte** of Paris during spring 2015, in the framework of the UNESCO world year of Light. The master student will be fully involved in this exhibition.
- to monitor by ultrafast laser spectroscopy the characteristics of the energy conversion process, the photo-induced phase transition of the polymer and its consequences on the optical response,
- to analyze the results in order to further optimize the nanohybrids for biomedical applications.

This internship is a **unique occasion to participate to an ambitious multidisciplinary project. It is likely to open toward a PhD** where the optically-controlled targeting of cells and tumours as well as their destruction by photo-induced hyperthermia will be studied in close partnership with biologists and physicians.

Partnership

The work for this internship will be carried out in close partnership with a chemistry laboratory involved in the project: the laboratory *Science et Ingénierie de la Matière Molle (SIMM)* in ESPCI, Paris, and the *Laboratoire de Chimie Physique* in Paris Sud University, Orsay.

Ce stage pourra-t-il se prolonger en thèse ? Possibility of a PhD ? : Oui +++

Si oui, financement de thèse envisagé/ financial support for the PhD: Allocation de thèse ED

Lasers, Optique, Matière	oui	Lumière, Matière, Interactions	oui
Plasmas : de l'espace au laboratoire			