Spécialité de Master « Optique, Matière, Paris »

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

Proposition de stage

Date de la proposition : 02/10/18

Responsable du stage */ internship supervisor*:

Nom / *name*: Schwob — Prénom/ *first name* : Catherine

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schwob@insp.jussieu.fr

Nom du Laboratoire / *laboratory name*:

Code d'identification : UMR 7588 — Organisme : Institut des NanoSciences de Paris

Site Internet / *web site*: www.insp.jussieu.fr

Adresse / *address:* 4 place Jussieu, 75005 Paris

Lieu du stage / *internship place*: campus Jussieu, tour 22/32, 5ème étage

Titre du stage / *internship title*: Optical sensor for the detection of nanoparticles

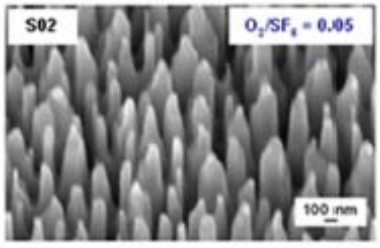
Résumé / *summary*

This internship, at the interface between optics and chemistry, will take place in the group «Nanostructures et Optique» of the Institut des NanoSciences de Paris.

Nanoparticles are extensively present in our very-day life. Indeed, due to the particular properties induced by their small size, they are used in many fields such as food, clothes, painting and cosmetic manufacturing. The quantity of nanoparticles soluble in water and consequently salted out in aquatic environment is impressive and, due to their small size, they cannot be filtered by sewage treatment plant. A particular challenge lies on the measurement of the exposure to nanoparticles with selective recognition and ability of size measurements.

The purpose of this internship is to develop a sensor of nanoparticles (silica and titanium oxide), based on imprinted polymers and photonic devices such as randomly-arranged micro-structured black silicon, which is a perfect absorber of visible light, coupled with an optical detection.

The principle of recognition is based on the imprint of the target nanoparticle in a hydrogel polymer. Indeed, the nanoparticle leaves specific nano-cavities within the polymer. The nano-cavities reuptake the imprinted nanoparticle, leading to a swelling of the polymer dependent on the target particle concentration. If the imprinted polymer is infiltrated with fluorescent nano-emitters in the black silicon structure, the swelling in the presence of the target particle will induce a filling of the structure and so lead to a reduced absorption. The target nanoparticle will so be detected through the enhancement of fluorescence.



SEM image of black silicon (image from Nguyen et al, JAP, **113**, 194903, 2013)

This project is mainly experimental. The applicant will work on the different parts of the project from the synthesis of the imprinted polymer to the structural characterization and the optical study of the silicon structures. The optical part will mainly consists in angle-resolved reflection spectroscopy and photoluminescence measurements.

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

Si oui, financement de thèse envisagé/ *financial support for the PhD***: Ecole Doctorale**

Lumière, Matière, Interactions	**X**	Lasers, Optique, Matière	**X**

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