Spécialité de Master « Optique, Matière, Plasmas »

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

Proposition de stage

Date de la proposition : 09 Octobre 2014

Responsable du stage / *internship supervisor*:

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Nom du Laboratoire / *laboratory name*: Institut Langevin

Code d'identification : UMR 7587 Organisme : ESPCI et CNRS

Site Internet / *web site*: http://www.institut-langevin.espci.fr/optical_antennas

Adresse / *address:* 1 rue Jussieu 75005 Paris

Lieu du stage / *internship place*: 1 rue Jussieu 75005 Paris

Titre du stage / *internship title*: **Single-molecule optical sensors based on a versatile gold-DNA origami platform**

The ability of noble metal nanostructures to translate a local biochemical information into a macroscopic optical signal has paved the way to the development of two commercial sensing techniques: Surface Plasmon Resonance (SPR) spectroscopy and colorimetric sensing. In this project, we aim at miniaturizing a colorimetric sensor down to a single nanostructure to reach sensitivities beyond SPR while maintaining a simple measurement strategy: color monitoring on a consumer-grade CCD camera.

The sensor is built around a complex 3D DNA scaffold exhibiting a specific recognition site for an analyte, and associated to two gold nanoparticles (AuNPs, Figure 1-a). These AuNPs will translate optically the nanometer-scale deformation of the DNA scaffold upon interaction with a target biomolecule as indicated on Figure 1-a. Figures 1-b and 1-c summarize the measurement process: the light scattered by each sensor is measured on a color CCD camera. After calibration, the measured resonance wavelength allows us to estimate the interparticle distance (Figure 1-c).

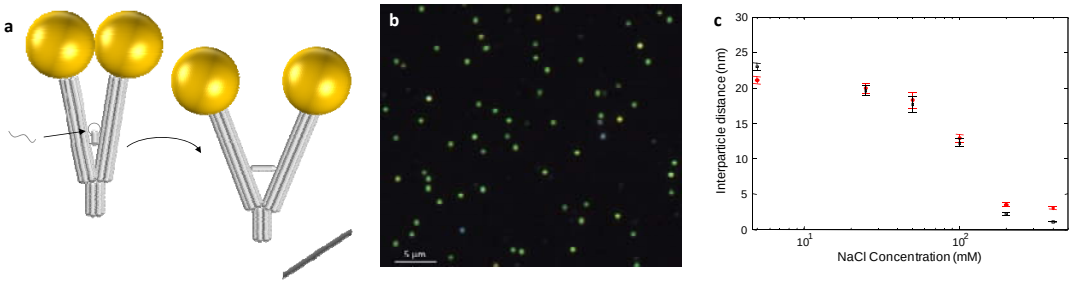

Figure 1: (a) Schematic representation of the sensor geometry. (b) Darkfield image of individual 40 nm dimers linked by a 50 base-pair DNA linker and measured on a color CCD camera. (c) Interparticle distance estimated from confocal scattering spectroscopy (black) and color CCD analysis (red).

We have expertise on the synthesis and optical study of plasmonic nanostructures built around DNA (M.P. Buson et al, Nano Lett. 11, 5060 (2011), Nature Commun. 3, 962 (2012) & Nano Lett. 14 , 284 (2014)) and on the design of dynamic architectures (L. Lermusiaux et al, ACS Nano 6, 10992 (2012)). Expertise on the design and fabrication of 3D DNA origami scaffolds will be provided by our collaborator in Montpellier (G. Bellot, IGF).

The development of such versatile nanostructures has tremendous potential in several industrial applications such as ultra-sensitive diagnostics or trace contaminant detection in water.

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***: demande effectuée au CNRS (1/2 bourse), projet ANR en cours de soumission et bourse doctorale**

Lasers, Optique, Matière	**OUI**	Lumière, Matière : Mesures Extrêmes	**OUI**
Plasmas : de l'espace au laboratoire	**OUI**		