Spécialité de Master « Optique, Matière, Paris »

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

Proposition de stage

Date de la proposition : 14/10/15

Responsables du stage / *internship supervisors*:

Noms / *name*: Barisien, Legrand — Prénoms/ *first name* : Thierry, Laurent

Tél : (33)/(0)44.27.46.08 — Fax :(33)/(0)1.44.27.39.82

Courriel / *mail*:
barisien@insp.jussieu.fr, legrand@insp.jussieu.fr

Nom du Laboratoire / *laboratory name*: Institut des NanoSciences de Paris (INSP)

Code d'identification :UMR 7588 — Organisme : INSP

Site Internet / *web site*: http://www.insp.jussieu.fr/Fils-quantiques-organiques.html

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

Lieu du stage / *internship place*: campus Jussieu, T 22-32 2ème étage.

Titre du stage / *internship title*: Dynamics of exciton delocalization in quantum wires probed by coherent control

Résumé / *summary*

For a few years advanced molecular or polymer based materials have been processed in the group in order to promote the emergence of intriguing electronic and optical properties to be implemented in nanophotonic devices. Among these materials a class of conjugated polymer (polydiacetylene) attracted much attention. Diacetylene units can indeed be polymerized in the solid phase to generate long ($\ell \sim 10$ microns) luminescent macro-molecular wires (polymer chains) inside which conformational disorder is removed. Strong dilution can be reached inside the host matrix so that studies of individual wires in optical far field microscopy experiments are possible. In such systems electron delocalization along the chain axis as well as ultimate confinement in the transverse directions determine the nature of the primary excitations (excitons) and control the optical properties. Previous studies have demonstrated that, in the longest wires, energy migration could occur over ultrafast time scales: a localized photo-excitation (~1 micron²) generated at a given point along the polymer chain delocalizes to the whole chain (within a few picoseconds) to form a stationary state with large spatial coherence length (the chain length typically). The further step in the study includes time resolution of the transitory regime that leads to the observed spatially extended state. The applicant will participate to the experiments that will allow to progress in that direction and probe the model formulated to describe the intrachain energy transfer. The measurements will be done using a confocal microscope coupled to an imaging spectrometer and a cooled detector. As direct time resolved imaging is impossible due to the extremely short duration of the process, the delocalization dynamics will be studied in both time and space resolved experiments, using an original coherent control technique presently developed in the group.
The proposed studies are rather of fundamental nature; they allow gaining insights into the mechanisms that determine the intrinsic basic properties of well-ordered conjugated systems. They are of interest in several fields like for instance in photovoltaics where rapid and efficient excitonic transfer is required.

Techniques in use: micro-photoluminescence, imaging, coherent control
Applicant skills: taste for experimental work, good knowledge of light-condensed matter interaction

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**

*Fiche à transmettre (fichier pdf **obligatoirement**) sur le site http://stages.master-omp.fr*