MASTER DE CHIMIE DE PARIS CENTRE - M2S2
Proposition de stage 2020-2021
Internship Proposal 2020-2021

Parcours type(s) / *Specialty(ies) :*

☐ Chimie Analytique, Physique et Théorique / *Analytical, Physical and Theoretical Chemistry* :
x Chimie Moléculaire / *Molecular Chemistry* :
☐ Chimie et Sciences Du Vivant / *Chemistry and Life Sciences* :
x Chimie des Matériaux / *Materials Chemistry:*
☐ Ingénierie Chimique / *Chemical Engineering:*

Laboratoire d'accueil / *Host Institution*

Intitulés / *Name* : Institut Parisien de Chimie Moléculaire (IPCM), UMR 8232
Adresse / *Address* : Sorbonne Université, 4 place Jussieu, Paris
Directeur / *Director (legal representative) :* Louis FENSTERBANK (Anna PROUST)
Tél / *Tel* : 01 44 27 70 68
E-mail : louis.fensterbank@sorbonne-universite.fr

Equipe d'accueil / *Hosting Team :* Chimie des Polymères

Adresse / *Address :* Sorbonne Université, tour 43-53, 4ème étage, 4 place Jussieu, Paris
Responsable équipe / *Team leader* : Laurent BOUTEILLER
Site Web / ***Web site :*** http://www.ipcm.fr/article599.html
Responsable du stage (encadrant) / *Direct Supervisor : Jutta Rieger, Lydia Sosa Vargas*
Fonction / *Position :* Chargé de Recherche (CNRS) - Chargé de Recherche (CNRS)
Tél / *Tel* : 01 44 27 51 37/ 01 44 27 55 85
E-mail : jutta.rieger@sorbonne-universite.fr; lydia.sosa-vargas@sorbonne-universite.fr

Période de stage / *Internship period**: 18 janvier 2021 – juin/juillet 2021
Gratification / *Salary:* ~550 €/mois

Title: Synthesis and Characterizations of Fluorescent Polymer Assemblies

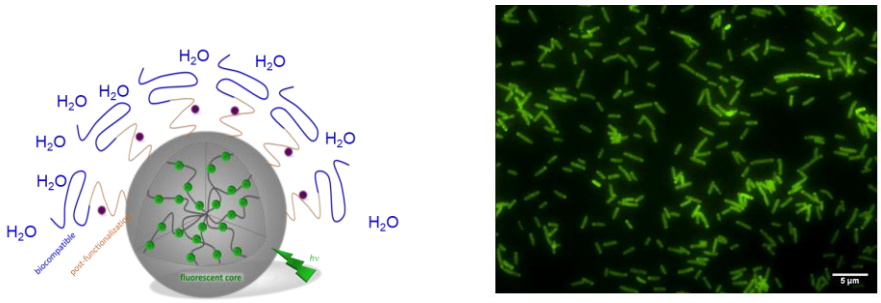
1. Description of the project

To date, polymer-based organic light-emitting diodes (PLEDs) have caught up with the inorganic-based LED market due to their facile processability, for low cost, large scale device fabrication, and their tunable chemical structure, which permits access to devices of a wide range of colors, performances and operating lifetimes.[1] Nevertheless, the main issue with polymer-based emissive materials, is that the molecular fluorescence properties observed in solution are often not maintained in the bulk.[2] Controlling the assembly of emissive polymers – in terms of distances between macromolecules and spatial arrangement between fluorophores - at the nanoscale would enable us to improve the emission efficiencies of functional polymeric materials both in solution and in bulk.

Whilst *Reversible Deactivation Radical Polymerization* (RDRP) is a useful polymerization technique for the preparation of well-defined functional macromolecular architectures, *Polymerization-Induced Self-Assembly* (PISA) is a straightforward and well-established method to prepare *in situ* nano-assemblies of different morphologies, *e.g.* nanospheres, cylinders or vesicles.[3,4]

* min. 5 mois à partir du 18 janv 2021 / *min. 5 months not earlier than January, 18th 2021.*
Fin de stage au plus tard le 16/07/2021 ou le 30/09/2021 (dates de validation de diplôme). / *End of internship at the latest July 16, 2021 or Sept. 30, 2021 (dates of graduation).*

We have previously demonstrated that RDRP and PISA are valuable tools to synthesize ultra-bright fluorescent nanoparticles, which could be successfully used as pH-sensors and/or bacterial imaging.[5,6,7]



Left: Schematic representation of fluorescent nanoparticles obtained through PISA; *right*: Fluorescence images of *E.coli* labelled with fluorescent polymer GFPC (see reference 5).

In this internship, the aim is to use RDRP/PISA to synthesize - in water- nano-objects of different morphologies with tunable emissive properties.

We are looking for a highly motivated M2 student with good lab skills. Knowledge on RDRP techniques as well as polymer characterization is appreciated. This project offers the possibility to the intern to increase his practice in organic chemistry, polymer synthesis using a new green technology (PISA) and to apply various characterization techniques that will be highly useful either for an academic career or in industry.

2. Specific techniques or methods

The main work of this internship will be to (1) synthesize fluorescent building blocks, (2) prepare fluorescent polymer assemblies, (3) characterize these self-assembly and (4) tune the emissive properties.

3. References

[1] Sekine, C.; Tsubata, Y.; Yamada, T.; Kitano, M.; Doi, S., Sci. Techno. Adv. Mat. **2014**, 15 (3), 034203.
[2] Facchetti, A., Chem. Mater. **2011**, 23 (3), 733.
[3] J. Rieger, *Macromol. Rapid Commun.* **2015**, 36, 1458.
[4] F. D'Agosto, J. Rieger, M. Lansalot, *Angew. Chem.* **2020**, 59 (22), 8368.
[5] C. Grazon, J. Rieger, R. Méallet-Renault, G. Clavier, B. Charleux, *Macromol. Rapid Commun.* **2011**, 32 (9-10), 699.
[6] Y. Si, C. Grazon, G. Clavier, J. Rieger, Y. Tian, J.-F. Audibert, B. Sclavi, R. Méallet-Renault, *ACS Sens.* **2020**, 5, 2843.
[7] C. Grazon, Y. Si, J.-P. Placial, J. Rieger, R. Méallet-Renault, G. Clavier, *Photochem. Photobiol. Sci.* **2019**, 18, 1156.