

Master in Chemistry
Sujet de stage de Master 2 (1 page max.)

Laboratoire : DCM

Directeur : Didier Boturyn

Intitulé de l'équipe : I2BM

Responsable : Didier Boturyn

Nom et Qualité du Responsable du Stage : Galina DUBACHEVA, CRCN CNRS

HDR oui

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Parcours de Master 2 (*Rayer la/les mention(s) inutile(s)*) : Polymers for Advanced Technologies (PTA)

Titre du sujet : Thermo-responsive nano-assemblies for multifunctional bio-analysis

Objectifs visés du stage (5 lignes max) :

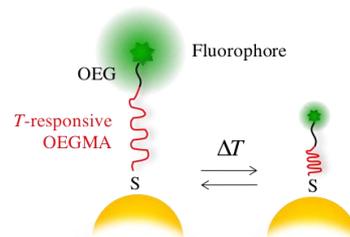
The main objective is to study physico-chemical properties of fluorescently labelled thermo-responsive copolymers and to provide an example of a hybrid system allowing to detect temperature variations at nanoscale. The stage will be done in collaboration between **Dr. G.V. Dubacheva (I2BM, DCM)** and **Prof. R. Auzély (SMP, CERMAV)** and will be supported by the **LabEx Arcane Ticket grant (2022-24)**.

Intérêts pédagogiques et compétences visées (5 lignes max) :

The candidate will take a part in an interdisciplinary project, which will allow to enlarge his/her experimental skills in polymer chemistry and physico-chemical characterization and to obtain complementary experience in the analysis and communication of scientific results (reports, posters, presentations).

Résumé :

Hybrid systems made of metal nanoparticles conjugated with functional molecules are of great interest because of their unique optical, electrical and bio-mimetic properties. The current challenge is to achieve a dynamic control on their configuration, as a promising route to drive their functionality. In this context, we propose to create dynamic nano-assemblies combining plasmonic properties with thermo-responsive behavior (Kamzabek et al, *Langmuir*, **2021**, 37:10971). Me NPs will be linked with fluorophores through biocompatible thermo-responsive linkers such as oligo(ethylene glycol) methacrylate copolymers. Thanks to their tunable transition temperature (25 – 90 °C), they can match different biological conditions from physiological to hyperthermic (e.g. during photothermal therapy). Our preliminary results demonstrate that these copolymers maintain their switchable behavior after functionalization with fluorophores and grafting to metal surfaces. Temperature variations are expected to induce shrinking/swelling of the polymer shell, which will provoke changes in the NP/fluorophore distance, resulting in reversible fluorescence switching.



Approches & matériels utilisés (5 lignes max) :

Depending on his/her background, the candidate will have the opportunity to explore different methodological approaches including synthetic chemistry (synthesis and functionalization of thermo-responsive copolymers, characterization by NMR, UV-visible), surface chemistry (functionalization of metal nanoparticles, planar metal surfaces, self-assembly) and physico-chemical characterization using state-of-the-art equipment of our laboratories (DLS, UV-visible, fluorescence, QCM-D, ellipsometry).

Domaines de compétences souhaitées du candidat (3 lignes max) :

We search for the candidate with background in supramolecular chemistry and motivation to work in an interdisciplinary research environment. Experience in organic synthesis is desirable. Skills in physico-chemical characterization would be appreciated. The working language is English or French.

Dates du stage : January-July 2023