

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)*) : Chemistry for Life Sciences (CLS)

Titre du sujet : Bio-inspired functional surfaces based on polymer brushes

Objectifs visés du stage (5 lignes max) :

The main objective is to characterize physico-chemical properties of polymer coatings, including thermo-responsive behavior of polymer brushes and bio-inspired model surfaces based on streptavidin/biotin interactions. The stage will be done under the supervision of **Dr. G.V. Dubacheva (I2BM, DCM)** and will be supported by the **LabEx Arcane Ticket grant (2022-24)**.

Intérêts pédagogiques et compétences visées (5 lignes max) :

The candidate will enlarge his/her experimental skills in surface chemistry and physico-chemical characterization of (bio)molecular interactions and will obtain complementary experience in the analysis and communication of scientific results (reports, posters, presentations).

Résumé :

Several projects in our team involve functional polymer coatings, which demand in-depth characterization by several complementary biophysical techniques such as quartz crystal microbalance with dissipation monitoring (QCM-D), surface plasmon resonance (SPR), fluorescence and ellipsometry. A unique combination of these techniques allows to study multiple parameters such as the efficiency of surface functionalization, binding kinetics, thickness and viscoelastic properties of the obtained films, their molecular density and hydration. Two systems will be studied. The first system is based on thermo-responsive polymer brushes, whose switching behavior in solution will be compared to that on the surface. The influence of several parameters on the switching efficiency will be studied, including the size and the surface density of polymer chains. The optimized conditions will be used for the design of hybrid systems for biomedical applications (*Langmuir*, **2021**, 37:10971). The second system involves streptavidin(SAv)/biotin interactions, which are widely used in biotechnology for labeling, detection and purification. SAv-mediated assembly at interfaces provided the basis for various supramolecular architectures intended for biosensors, biospecific targeting, drug delivery, bioactive coatings and biomimetic model systems. It was shown that surface chemistry plays an important role in SAv/biotin interactions and can be used to control the residual valency and orientation of SAv on biotinylated self-assembled monolayers and supported lipid bilayers (*J. Am. Chem. Soc.*, **2017**, 139:4157). Our goal is to study SAv/biotin interactions at tailor-made copolymer brushes, which are widely used in material and biological sciences.

Approches & matériels utilisés (5 lignes max) :

The student will have opportunity to explore different methodological approaches including surface chemistry (surface functionalization, polymer brushes, SAv/biotin chemistry) and physico-chemical characterization using state-of-the-art equipment of our laboratory (QCM-D, SPR, ellipsometry, fluorescence).

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

The candidate should be motivated to work in interdisciplinary research team. A background in supramolecular chemistry or a related field is required. Skills in surface functionalization and physico-chemical characterization would be appreciated. The working language is English or French.

Dates du stage : January-July 2023