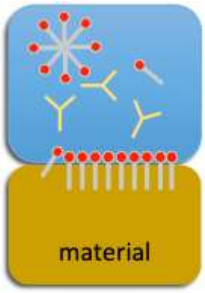
2019-2020

Internship proposal at LMGP Lab.

Surface adsorption of surfactants as a function of material properties: design of a screening test

Abstract

Biological molecules (proteins and others) represent an increasing part of today's therapeutics. Proteins are complex macromolecules that are inherently unstable and have a tendency to adsorb on surfaces and air interfaces. Biotherapeutics are thus developed as formulated solutions containing, among others, surfactants that protect the proteins against adsorption at interfaces and subsequent aggregation. These surfactants can stabilize a protein solution because they are able to cover interfaces and thus shield them from proteins in solution. The efficacy of surfactant stabilization is dictated by their interaction capacity with a given surface. We are investigating surface adsorption of surfactants as a function of the nature of materials in order to develop a screening test for optimal surfactant-material combinations.



Project description

We are working with surfactants that differ in their hydrophobic moiety and their hydrophilic headgroup. Their capacity to adsorb stably to a hydrophobic surface depends on the interaction forces that the hydrophobic moiety develops with the surface. We have shown that there is a significant difference in surfactant surface adsorption between highly aligned self-assembled monolayers of aliphatic side chains and random polymer meshes, as present in plastics. The project consists in testing different surfactants for their adsorption properties on chosen material surfaces.

Methodology: We will set up a screening test based on the water contact angle difference (hydrophobic => hydrophilic), induced by the adsorption of surfactants on hydrophobic materials. Their capacity to adsorb to surfaces will be investigated with surface sensitive techniques such as SPR* and QCM-d**. Their potential in preventing antibody binding can also be tested using an ELISA-based assay.

Objectives: The outcome will be to shed light on the mechanisms involved in surfactant adsorption to surfaces and to propose a screening strategy to identify ideal surfactant-material combinations for formulation optimization.

Scientific environment:

The candidate will work within the LMGP, Materials and Physical Engineering Laboratory, in the IMBM group in close collaboration with the Department of Biopharmaceutics Development of Sanofi in Vitry. The candidate will be working with G Lefebvre, Cifre PhD student.
Located in the heart of an exceptional scientific environment, the LMGP offers the applicant a rewarding place to work.
LMGP Web Site: http://www.lmgp.grenoble-inp.fr/
Profile & requested skills:
We look for a student with a strong knowledge in biochemistry, biophysics and/or in material science. The student should be able to work in a team, have good writing skills (report, presentation…) and a good knowledge of spoken and written English.
The internship will be from February 2020 for a duration of 6 months.

Subject could be continued with a PhD thesis: possibly

Allowance: Internship allowance will be provided (approx. 550 € /month)

CONTACT : Send a *C.V.* and a cover letter to Marianne Weidenhaupt: marianne.weidenhaupt@grenoble-inp.fr;

*SPRi = Surface Plasmon Resonance imaging
**QCM-d = Quatz Cristal Microbalance with dissipation monitoring