2024-2025 Internship proposal at LMGP Lab.

Multifunctional anti-fouling surfaces

Context

Bacterial proliferation on surfaces can have disastrous consequences, as the tragedies caused by food contaminated during production showed some time ago. At the same time, the proliferation of marine organisms on the surface of submerged materials has a major economic and ecological impact, as it leads to the over-consumption of fossil fuels. However, when we look at the adhesion mechanisms of very different biological species, we see that the initial adhesion stages are similar. It therefore appears that neutralising the early stages of this process would provide a global solution to the problems associated with biofouling.

Project description

The aim of this project is to make the most of LMGP's expertise in the rapid prototyping of sub-micron patterns with controlled wettability and SyMMES' experience in the development of bio-inspired anti-microbial molecules and the optical characterisation of bactericidal or bacteriostatic activity.

Project tasks

During this project, the intern will:

- made different bio-inspired nanometric patterns alternating super-hydrophilicity and super-hydrophobicity to determine the optimum conditions for limiting biological adhesion. These patterns will be produced using the know-how developed at the LMGP concerning surfaces with controlled wettability and will be produced using the nanometric resolution capillary printer recently acquired by the LMGP.
- study the incorporation of anti-microbial peptides into the inorganic matrices making up these motifs. This type of molecule has the advantage of not containing a fluorine atom, as is the case with most superhydrophobic molecules (currently being banned for industrial applications), and is suitable for use in aqueous or dry media. This surface encapsulation of peptides will be based on the skills developed at SyMMES.
- Study the ability of surfaces to inhibit the formation of biofilms and the growth of micro-organisms by photocatalysis. Photocatalysis reactions induce the formation of superoxidant radicals capable of eradicating bacteria located in the environment very close to the surfaces. This study will draw on the complementary knowledge of the SyMMES and LMGP teams.

Scientific environment

The candidate will work within the LMGP, Materials and Physical Engineering Laboratory, and the Symmes, Molecular Chemistry department. Located in the heart of an exceptional scientific environment at Grenoble's scientific peninsula, the LMGP and the Symmes offer the applicant a rewarding place to work.
LMGP Web Site: http://www.lmgp.grenoble-inp.fr/
SyMMES Web Site: https://www.symmes.fr/

Profile & requested skills

We look for a highly motivated student with a good background in
The candidate must have :

- Knowledges in materials science and more particularly in sol-gel and liquid solution chemistry and in experimental techniques for materials characterization (SEM, XRD, AFM ...)
- Rigor, autonomy and interdisciplinarity
- Fluency in English and excellent presentation and writing skills

Subject could be continued with a PhD thesis: Yes

Allowance: Internship allowance will be provided

CONTACT

To apply, please send a CV and motivation letter to
David Riassetto (LMGP): David.Riassetto@grenoble-inp.fr
Yoann Roupioz (SyMMES): yoann.roupioz@cea.fr