2015-2016

Internship proposal (Master or final project engineering school) at the LMGP

BioActiveCoatings: Automated deposition of thin films in multi-well plates for cell culture studies

Abstract

High throughput in biological assays has become a focus of today's research. Cell culture is a method used for growing living cells artificially outside their natural environment under controlled conditions. It is used for a large range of applications such as studies of cellular functions, drug discovery, biotechnologies and regenerative medicine. Cell culture in vitro is generally performed on plastic substrates, especially multi-well plates or Petri dishes that are made of polystyrene, a very stiff and synthetic material. However, this stiff substrate can bias the experimental results and mask cellular responses. Indeed, these culture conditions contrast drastically with the cellular microenvironment in vivo, where the cells are surrounded by a soft extra-cellular matrix (ECM) that provides mechanical and biochemical signals. Our aim in the *BioaActiveCoatings* project, which is supported by the European Commission (European Research Council) is to engineer thin films made of biopolymers as coating of multiple well plates for cell culture. We will bring to the market surface-coated plates with a control over thickness, stiffness and presentation of bioactive molecules (peptide, growth factor).

Detailed internship proposal

Layer-by-layer films are a new type of self-assembled materials, which are more and more widely used by research groups in view of their potential applications (*1*) and which begin to be used by industrial companies. Our IMBM group has an internationally recognized expertise in the engineering of layer-by-layer films made of biopolymers (*2, 3*).

The innovative strategy of the *BioaActiveCoatings* project consists in using the layer-by-layer assembly of biopolymers in multi-well plates, which are compatible with biological assays and optical microscopy. The LbL-coated multi-well plates will broaden the application of cell culture plates in research and industry for fundamental biological studies, production of biological molecules, diagnosis and regenerative medicine.

The aims of the internship are: 1) to create a custom-made platform by fully exploiting the potentialities of an automate to build the layer-by-layer films; 2) to characterize the as-prepared films by several physical-chemical techniques (confocal microscopy, infrared spectroscopy, profilometry and AFM) and biological assays in order to assess their reproducibility, homogeneity and bioactivity.

Location

The candidate will be working at the LMGP lab in the IMBM team in collaboration with a company developing automated liquid handling machines. For more information about the lab and team : http://www.lmgp.grenoble-inp.EN/

Profile & requested skills

5th year engineering school with an interest for biomedical instrumentation and characterization techniques of biological & polymeric materials. This internship is at the interface between engineering and life sciences. Aptitude for teamwork, good spoken and written English are requested.

Stipend: a "gratification" will be provided following the French law.

Continuation of the project : this project may be continued via an engineer position (contractual position)

Application : please send a CV + a cover letter (including names/contact email of 2 referees) + the record of your grades of the 2 past academic years (2013/2014 & 2014/2015) to **Catherine.picart@grenoble-inp.fr ; Thomas.boudou@grenoble-inp.fr**

References

1. J. J. Richardson, M. Bjornmalm, F. Caruso, Multilayer assembly. Technology-driven layer-by-layer assembly of nanofilms. *Science* **348**, aaa2491 (2015).
2. T. Boudou, T. Crouzier, K. Ren, G. Blin, C. Picart, Multiple functionalities of polyelectrolyte multilayer films: new biomedical applications. *Adv. Mater.* **22**, 441 (2010).
3. C. Monge, J. Almodovar, T. Boudou, C. Picart, Spatio-Temporal Control of LbL Films for Biomedical Applications: From 2D to 3D. *Advanced healthcare materials* **4**, 811 (2015).