Group	:	Responsive Polymers
Project	:	Development Bioactive Antifouling Smart Interactive Surfaces
Supervisors	:	Andriy Kuzmyn, Maarten M. J. Smulders and Han Zuilhof

Introduction

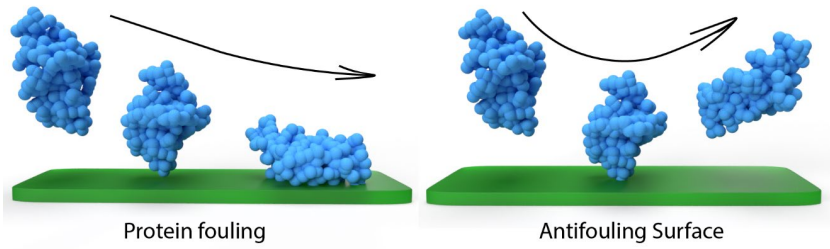

Figure 1 Schematic representation of protein fouling on surfaces and antifouling surfaces.

In a wide range of situations, surfaces will come into contact with solutions that contain proteins. Such situations may be everyday ones that are easy to see, such as evident from the growth of biofilms on ship hulls, or less obvious ones, such as protein adsorption on biosensor surfaces.[1-3] In such situations, the proteins will non-specifically adsorb onto the surface in contact with the fluid. This process is also called protein fouling (Figure 1). Antifouling coatings are layers that prevent the non-specific adsorption of proteins. For both the highly hydrophilic and hydrophobic surfaces, there are numerous approaches for creating antifouling coatings. Currently, the coatings that are most effective in preventing protein fouling from complex biological media, eukaryotic, and bacterial cells are based on polymer brushes. Those surfaces play a crucial role in biosensors and tissue engineering, interacting specifically only with certain biomolecules or cells (Figure 2). This means that the introduction of the bioactive moiety in the antifouling polymer brush, those surfaces also called bioactive surfaces.[1-3]

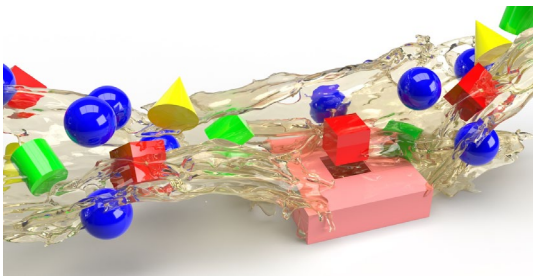

Figure 2. *Cheneral scheme of bioactive surfaces*

Research topics

The design of smart bioactive coatings consists of multiple steps and projects each step or combination can constitute the main focus of the research project. The goal of the project will be jointly decided by the student and project supervisors. The individual steps primarily entail:

- Synthesis of complex macromolecular structures based on PLL (*please check more here*[4]) to be immobilized on surfaces;
- Synthesis of polymer brushes using light-triggered techniques such as PET-RAFT;
- Characterization and functionalization of modified surfaces.

Techniques to be used

Several synthetic and analytical techniques are of relevance, amongst others:

- General organic and polymer synthesis techniques such as reaction set-up, TLC, column chromatography, GPC, DLS, IR-spectroscopy, and NMR.
- Control Living Polymerisation techniques such as RAFT and ATRP.
- Surface modification techniques including plasma cleaning, surface-initiated polymerizations and self-assembled monolayers.
- Surface characterisation techniques such as water contact angle measurements, ellipsometry, XPS, AFM, and IRRAS.

More information

Andriy Kuzmyn, room Helix 8.055, tel. 0317-48364, e-mail: andrii.kuzmyn@wur.nl.
Maarten Smulders, room Helix 8.057, tel. 0317–480435, e-mail: maarten.smulders@wur.nl.

References

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