Plasma Modification For Designing Reversible Mechanoresponsive Bioactive Surfaces

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The design of responsive materials and in particular mechanosensitive materials is now thoroughly investigated and it emerges as an extremely hot topic [1]. We present here two examples of mechanoresponsive surfaces designed *i)* by using plasma polymers as platforms to attach materials sensitive to the mechanical stimuli or *ii)* by exploiting intrinsic properties of plasma polymers to change their performances under stretching.
The first example concerns chemo- and cyto- mechanoresponsive surfaces (figure 1) which become proteins adsorbent or cell adherent under stretching in a fully reversible way. Our strategy is based on grafting ligands directly on a plasma modified elastomeric substrate embedded in a PEG brush [3]. By stretching the substrate, the ligands become accessible to proteinic receptors. Retunrning to the non-stretched state, the pressure exerted on the proteins induces their expelling assuring a full reversibility of the process.

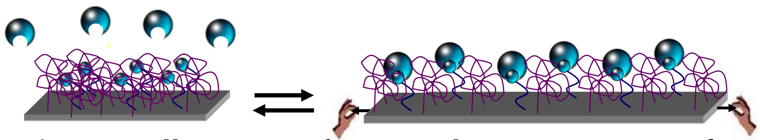

Figure 1: *Illustration of cyto-mechanoresponsive surface*

The second example concerns the effect of mechanical stimuli on the release of bioactive agents (here antibacterial agent, figure 2) from a plasma multilayer matrix [4]. Owing to differences between mechanical properties of plasma-polymer thin films and the elastic bulk substrates, tensile strengths generate cracks within the plasma polymer, which might be used as diffusive channels for bioactive substances located between two plasma polymer thin films. The originality of this system is that the aperture of the crack can be controlled mechanically in a reversible way.

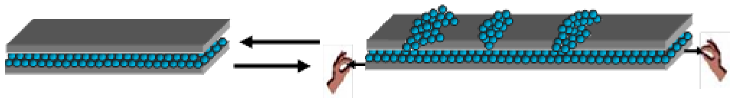

Figure 2: *Illustration of Mechanoresponsive bioactive surface*

Such surfaces would not only be of fundamental interest but could also present numerous potentialities from a technological point of view.

References

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