Master Matériaux

Ingénierie des matériaux - Ingénierie des polymères - Ingénierie des surfaces

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Titre : Model Surfaces for Tissue Engineering

Résumé : Tissue engineering emerges as a new field of engineering science that relies both on biology and materials science. "Living materials" are designed by seeding cells in synthetic matrices or depositing them on synthetic substrates and growing them to regenerate tissues or organs. The correct design of such materials requires a precise knowledge of the response and fate of the cells consecutive to their interaction with the surrounding material. Not only chemical but also mechanical properties of the adhering or surrounding material appear to play a central role in this respect. Until now, studies have concentrated on materials interacting with cells through non-specific interactions or through ligand-receptor interactions where the ligands were covalently fixed to the matrix. Our goal is to design new substrates encompassing cell adhesion ligands grafted to the adhesion substrate through multivalent non-covalent host-guest interactions. By varying the number of host-guest interactions and their chemical nature we will modulate the interaction strength of these ligands with the adhesion substrate. The stiffness of the underlying substrate will also be tuned. These model systems will be used to investigate cell adhesion and mesenchymal stem cell fate on systems where the ligands are attached covalently on the substrate to those where they are non-covalently anchored. Do cells feel stiff substrates with weakly bound ligands similarly to soft substrates with covalently coupled ligands? More precisely, the student will prepare and characterize gels whose surface functionalized with host molecules. He (or she) will then investigate the interaction with multivalent guests and investigate their adsorption behaviour. These surfaces will then be used for cell culture.

Veuillez préciser pour quel(s) parcours vous proposez votre sujet et mettez une croix devant la(les) spécialité(s) correspondante(s) :

- **X Ingénierie des matériaux / Physique des matériaux**
- **X Ingénierie des matériaux / Chimie des matériaux**
- **X Ingénierie des polymères**
- **X Ingénierie des surfaces**