Secteur des Sciences et Technologies

Invitation à la soutenance publique de thèse de

Madame Claire CHATTAWAY

Master bioingénieur : chimie et bioindustries

Pour l'obtention du grade de Docteur en sciences de l'ingénieur et technologie

« Nanostructured and redox-responsive gold surfaces for biomedical applications»

qui se déroulera

le mercredi 06 février 2019 à 14h

Auditoire DOYEN 21

Place des Doyens, 1

1348 Louvain-la-Neuve

Membres du jury :

Prof. Sophie Demoustier (UCLouvain), supervisor
Prof. Karine Glinel (UCLouvain), supervisor
Prof. Eric Gaigneaux (UCLouvain), chairperson
Prof. Christine Dupont (UCLouvain), secretary
Prof. Luc Vellutini (Université de Bordeaux, France)
Dr. Sabrina Belbekhouche (Université de Paris Est, France)

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The control of material surface properties has become a topic of high interest, in particular in the biomedical field where the surface characteristics of a biomaterial strongly impact its interactions with biological entities, such as proteins, cells or bacteria. This thesis explores different novel strategies of bringing multifunctionality, including chemical reactivity, topography and redox-responsiveness, to gold surfaces.

Thiolactone-based copolymers provide a simple and innovative way to produce stable polythiol layers on gold surfaces through aminolysis of the thiolactone rings. Indeed, part of the thiol groups released are involved in the formation of a stable sulfur-gold bond between the copolymer and the gold surface while another fraction remains free and available to further immobilize thiolated compounds through a cleavable disulfide bond, conferring redox properties to the surface.

In this thesis, two main strategies are developed to fabricate model nanostructured, multifunctional and redox-responsive surfaces using thiolactone-based copolymers. The first one consists in using a diamine derivative for the aminolysis of the thiolactone-containing copolymer to obtain surfaces with two different (amino and thiol) functional and derivatizable groups. The second strategy involves the spatio-functionalization of gold nanopillars by grafting the thiolactone copolymer on the top of the nanopillars and a self-assembled monolayer of carboxylic acid-terminated alkylthiols on the background. In both approaches, the chemical functions are then covalently modified with compounds of interest. For instance, the surfaces were modified with a bioadhesive RGD peptide and tested for human cell adhesion.

The main achievements of the present work are surface multifunctionality, patterning and ability of independently post-modify the surface chemical groups. These simple and innovative surface modification strategies could be used for various applications such as cell culture platforms or biosensing devices.