Secteur des Sciences et Technologies

Invitation à la soutenance publique de thèse de

Monsieur Guillaume STAELENS

Master ingénieur civil en chimie et science des matériaux

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

« Manufacture and characterization of self-assemblies of functionalized nanowires»

qui se déroulera
le mercredi 24 avril 2019 à 15h
Auditoire SUD 11
Place Croix du Sud
1348 Louvain-la-Neuve

Membres du jury :

Prof. Bernard Nysten (UCLouvain), supervisor
Prof. Alain Jonas (UCLouvain), supervisor
Prof. Jacques Devaux (UCLouvain), chairperson
Prof. Sophie Demoustier (UCLouvain), secretary
Prof. Tom Leyssens (UCLouvain)
Prof. Anne-Sophie Duwez (ULg, Belgique)
Prof. Gilles Bruylants (ULB, Belgique)

In nature, many organisms have the ability to adapt and change their structural configuration at the nanoscopic level, providing them an exquisite variety of properties and dynamic interactions with their environment. Mimicking such complex systems would open the path towards such properties and interactions. However the investigation of such systems requires first to understand and control the self-assembly of nanostructured systems and next to understand and control the reconfiguration mechanisms. This thesis aims at addressing the first part of this objective.

Based on a "bottom-up" approach, the objectives of this work are the design, the manufacture and the characterization of self-assemblies of (multi)functionalized nano-building blocks. These self-assemblies should be thin films presenting an ordered structure at a scale close to the one of the building blocks ("supra-crystalline") dependent on the system conditions, such as the pH or the temperature.

The nano-building blocks chosen here are functionalized nanowires (NWs) made of noble metals (Pt, Au or Pd). They were synthesized by electro-chemical deposition in nanoporous membranes. This templating method simultaneously allowed to chemically modify specific parts of the NW surface, especially their bases. The chemical functionalization was achieved using either thiol assembly or polyelectrolyte adsorption. Homogeneously functionalized as well as homogeneously multi-functionalized NWs were obtained. The NWs were then assembled using two different methods: drop-casting on functionalized substrates and assembly at the toluene-water interface. For the latter method, different techniques (fishing, drain-to-deposit or PDMS stamp inking) were tested to recover the assemblies on appropriate substrates, allowing their characterization by SEM or AFM. The influence of several parameters such as the nature of the nano-object, the functionalization of the nano-objects or substrate, the pH, etc. on the compactness (density) and organization of the assemblies was studied.