Functional thin films and surfaces from bottom-up colloid deposition

Isabelle POCHARD - *Institute UTINAM UMR 6213 CNRS, University Franche-Comte, Besancon, France*

This presentation illustrates how knowledges in physical chemistry of interfaces and colloids are helpful to understand and develop thin films and functional surfaces form bottom-up approaches. Original materials synthesized from colloidal assemblies will be presented as well as their specific properties and applications.

The originality of our work is to use various deposition techniques such as electrophoresis, self-assembly, dip-coating or spin-coating, but also physical or chemical vapor depositions with collaborators to produce films or functionalized surfaces. The colloidal particles utilized to elaborate the films are synthesized by ourselves in order to control their characteristics (morphology, size, surface chemistry). These particles can be inorganic (TiO_2, SiO_2, $Ni(OH)_2$) or organic (PS or PMMA latexes) colloids. The mastering of these processes allows us to design thin films and functionalize surfaces with tailored properties. The control of physicochemical parameters of the starting materials and deposition conditions are crucial to achieve the development of advanced materials with customized properties in connection with applications.

Among possible applications, conductive films for chemical gas sensors (NH_3, VOC) are widespread. Besides, flexible conductive materials for the development of stress sensors for robotic and biomedical applications present new technological and scientific challenges. The presentation will illustrate research studies done through several examples like microstructured films with superhydophobic features for self-cleaning surfaces. In the context of structured films, opals and inverse opals thin films will also be shown as colloidal crystals for photonic applications and photocatalysis. The development of electronic and ionic conductive films for the scope of energy applications will also be presented. Finally, an illustration of how a theoretical approach in the field of thermodynamic of small systems can possibly bring insights to adsorption and trace analysis will be shown.