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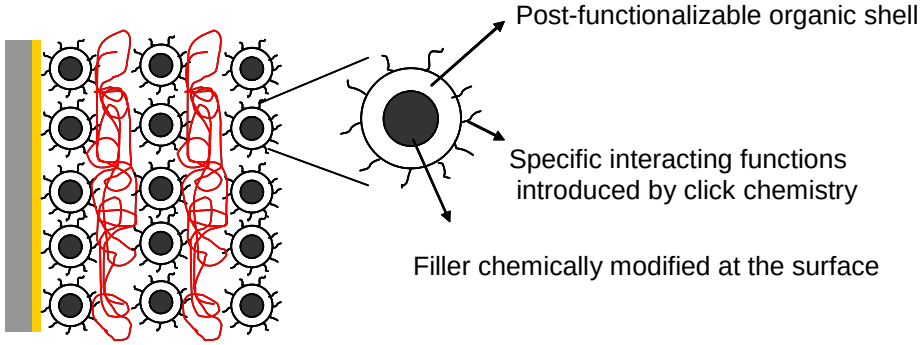
Functional (nano)fillers as novel partners to prepare (nano)composite films by the Layer by layer self-assembly strategy

For many years, a steadily increasing attention has been paid to the preparation of adhering polymer thin films onto solid inorganic surfaces with tunable and tailored properties. These coating are very relevant for fundamental interest and find various applications including, for example, drug delivery, protective or specific optical properties. Among the different possible strategies to prepare polymer thin films, the Layer by Layer (LbL) approach is among the most versatile and powerful one; it consists in building up a thin multilayered film through the successive deposition of specifically interacting nano-objects through physical interactions, and was initially developed with the use of oppositely charged polyelectrolytes[1]. In this way, multilayers with precise control over total thickness (from a few angstroms up to the micron level) and over the architecture can be obtained. When complex polymeric architectures and/or other surface modification pathways are combined to the LbL, original properties can be brought to the film. Our group has recently demonstrated that fine macromolecular design applied to the modification of the substrate[2] or the controlled synthesis of the partner(s)[3,4] could impart specific surface morphology and growth profile[5,6] to the film. By the way, we have also demonstrated that novel silica-based nanohybrids simply combined to specially design polymer used as a matrix could provide to the resulting nanocomposite film some peculiar properties by carefully controlling structural factors.[7]
Thus, in this project, we want to combine the two last cited approaches (LbL and nanocomposite films) in order to control all the features of the films (internal structure, growth profile, morphology, surface property). This project will in particular take benefits of our group recent achievements in the chemical modification of various particles used as fillers in nanocomposites.[8] One of the envisaged multilayered film is schematically represented below.



This multidisciplinary project mixes polymer synthesis (living/controlled radical polymerization), click chemistry, modification of nanofillers, preparation of nanocomposites, the building-up and fine characterization of multilayered films.

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