



MOSAIC - Patterning the surface of monolayer-protected nanoparticles to obtain intelligent nanodevices

While chemical science is still striving in the search for such molecular machinery, real and perfectly working molecular machines have been developed millions of years ago by Nature. When biological systems are considered, one striking feature that emerges is their intrinsic functional simplicity, since only a few building blocks are used to build complex structures. Apparently, what matters is not chemical complexity but the ability to precisely control the spatial arrangement and organization. Functional nano-particles offer an unmatched opportunity to build complex structures with simple building blocks and relatively simple manipulations.

The main goal of the Mosaic project is to gain the ability to hierarchically control the self-assembling of metal nano-particles coating mono-layers and take advantage from such ability to obtain complex function from the materials realized. This objective will require reaching a complete understanding of the structure and dynamic of nano-particles coating mono-layers developing new tools, mainly based on NMR spectroscopy, for their investigation. Then, we plan to learn how to use supra-molecular interactions to control the monolayer organization and to gain, in this way, the ability to program functional groups patterns on the surface of the particles. In this way, it will possible to achieve a degree of organization comparable to that of biologic systems, such as enzymes or membranes. This organization of functional groups will be then used to obtain highly sophisticated function by these nano-systems, such as recognition, sensing, in particular NIR sensing, catalysis and transport.

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