Prof. Luis M. Liz-Marzán
CIC biomaGUNE, Bionanoplasmonics Laboratory

Self-Assembly of Gold Nanoparticles toward Biodetection

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Abstract: Nanoplasmonics can be defined as the science studying the manipulation of light using materials of size much smaller than the radiation wavelength. This technology finds applications in various fields including sensing and diagnostics. An essential component of nanoplasmonics are the nanostructured materials, typically noble metals, which can very efficiently absorb and scatter light because of their ability to support coherent oscillations of free (conduction) electrons. Although the remarkable optical response of "finely divided" metals is well known since more than 150 years ago, the recent development of sophisticated characterization techniques and modeling methods has dramatically reactivated the field. An extremely important pillar supporting the development of nanoplasmonics has been the impressive advancement in fabrication methods, which provide us with an exquisite control over the composition and morphology of nanostructured metals. Colloid chemistry methods in particular have the advantages of simplicity and large scale production, while offering a number of parameters that can be used as a handle to direct not only nanoparticle morphology but also surface properties and subsequent processing.

This talk will present a selection of fabrication methods that allow fine tuning of the morphology of nanoplasmonic building blocks, with the ultimate goal of improving their optical properties and their performance in sensing applications. Several examples will be presented in which nanostructured materials comprising gold nanoparticles were used as substrates for ultrasensitive detection of biorelevant molecules.

I will also introduce recent efforts related to the use of 3D-printing for the fabrication of composite scaffolds that allow monitoring biological processes in realistic cell cultures.

References

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