Christmas Lecture

Invited Speaker:

Prof. Luis M. Liz-Marzán

12.00 h
December 20, 2012

Parque Tecnológico Bizkaia
Edif.101 (Barco)
Auditorium

Smart Composite Nanoparticles for Capture, Detection and Release

Determining precise diagnosis and proper therapeutic treatments for preventing and controlling pandemics and other bio-threads is central to human health. A variety of nanoparticle systems have been proposed which may even incorporate multiple functionalities that allow both detection and therapeutic actions. Metal nanoparticles in particular are of great interest because they display exceptional optical properties, related to localized surface plasmon resonances (LSPR), which give rise to well-defined absorption and scattering peaks in the visible and near-IR spectral range. Such resonances can be tuned through the size and shape of the nanoparticles, but are also extremely sensitive towards dielectric changes in the near proximity of the particles surface. Therefore, metal nanoparticles have been proposed as ideal candidates for biosensing applications. Additionally, surface plasmon resonances are characterized by large electric fields at the surface, which are responsible for the so-called surface enhanced Raman scattering (SERS) effect, which has rendered Raman spectroscopy a powerful analytical technique that allows ultrasensitive chemical or biochemical analysis, since the Raman scattering cross sections can be enhanced up to 10 orders of magnitude, so that very small amounts of analyte can be detected. In this lecture several examples of novel strategies to employ colloidal nanostructures comprising gold or silver in various morphologies and arrangements will be presented, as substrates for ultrasensitive detection of a wide variety of analytes, including relevant biomolecules such as prions or cancer markers, which in some cases require the design of novel techniques and composite materials for trapping them close to the metal nanostructures. Such composite nanostructures can also be foreseen as a smart system for controlled capture and release.

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