CIC biomaGUNE: CIF: G-20788840· Parque Tecnológico de San Sebastián · Pº Miramón 182· 20014 San Sebastián (Gipuzkoa)· Tel.: + 34 943 00 53 00· Fax: + 34 943 00 53 01· info@cicbiomagune.es ·www.cicbiomagune.es

CIC biomaGUNE
CENTER FOR COOPERATIVE RESEARCH IN BIOMATERIALS

seminar

Wednesday, 31st October, 12.00 pm, Seminar Room

Host: Prof. Luis M. Liz-Marzán

Dark and bright interlayer plasmons in colloidal nanoparticle multilayers

Stephanie Reich
Physics of Nanostructures
Freie Universität Berlin

Plasmonic excitation in metallic nanoparticles give rise to strong electromagnetic near-fields. Their most prominent application is surface-enhanced spectroscopy, in particular, Raman scattering. Through dephasing, plasmons are also excellent sources of highly excited hot electrons for photovoltaic energy harvesting and catalysis. An ideal plasmonic system allows the optical excitation of plasmons and is made from scalable and cost effective materials. It is also tailorable to allow optimizing plasmon energies and decay channels for a specific type of application.

Here I propose that colloidal multilayers and crystals made of gold nanoparticles meet the requirements of flexibility, scalability, and prize. We show by micro-absorbance and –reflectance measurements that the comparatively large size of the nanoparticles allows the excitation of different plasmon modes in addition to the dipole-type excitation widely considered. Of particular interest are nominally dark plasmons that absorb linearly polarized light due to field retardation. Their energy and width may be tailored via the interparticle distance and type of polarization. With increasing layer number, the dark modes evolve into standing waves resulting in 90% light transmission for hundreds of nm thick gold films. We discuss how to optimize the layered structures for surface-enhanced Raman scattering and hot-electron harvesting.