NanoPlasmonics : from surface enhanced Raman spectroscopy to metal enhanced fluorescence

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Plasmonics is now well established field finding numerous applications in pharmacology, biology, optoelectronics and metamaterials among others. For the detection of hazardous molecules or markers Surface Enhanced Raman Spectroscopy (SERS) and Metal Enhanced Fluorescence (MEF) are the most used. Both these enhanced spectroscopies are based on local field enhancement entailed in the near vicinity of metallic nanoparticles when Surface SERS can achieve single molecule detection when two or more metallic nanoparticles are near-field coupled, resulting in enhancements ranging between 6 and 10 orders of magnitude. Another approach for detecting various molecules is biochemical sensors relying on the detection of the spectral shift of the Surface Plasmon resonance of metallic nanoparticles after the adsorption of these same molecules. This contribution will show the ties between SERS, MEF and sensors. Some of the works of the LNIO group in that direction will also be presented. [1-3]. As an example, different enhancement and quenching behaviours of MEF are shown in Fig. 1. This figure shows the modification of luminescence of core/shell quantum dots (CdTe core) in presence of resonant gold nanoparticles of different sizes [3].

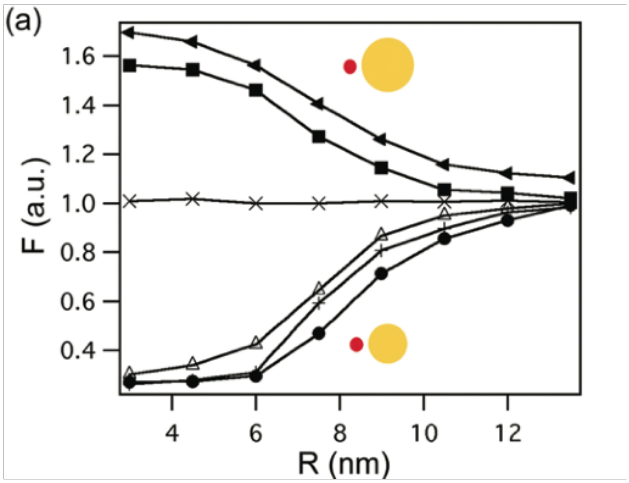

Fig. 1 : Luminescence modification factor F of quantum dots near gold nanocylinders in function of the distance R between dots and nanoparticles.

[1] J. Grand et al. Phys. Rev. B, 72, 033407 (2005)

[2] P. Viste, et al., ACS Nano, **4**, 759 (2010)

[3] G. Barbillon, J.L. Bijeon, J. Plain, M. Lamy de la Chapelle, P.M. Adam, P. Royer, Surf. Sci., 601, 5057-5061 (2007)