HYBRID NOBLE METAL-FERROMAGNET NANOPARTICLES FOR BIOSENSING APPLICATIONS: A PRELIMINARY STUDY.

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Surface plasmons are collective electronic excitations localized at the interface of a metal and a dielectric and they play a very important role in the optical properties of metallic systems. This physical principle is being successfully exploited to develop biosensing devices since surface plasmons are extremely sensitive to small dielectric modifications close to the metal surface. For instance, functionalized Au nanolayers are the basis of the Surface Plasmon Resonance sensor that has shown a high sensitivity detecting small biological molecules [1]. This sensitivity has been recently enhanced by combining noble metal materials that present plasmonic properties with ferromagnets that give rise to magneto-optical (MO) activity [2]. The origin is that such combination leads to an increased MO response when a surface plasmon is excited and allows the modulation of the optical signal [3].
An alternative and promising approach consists in the use of metallic nanoparticles to develop biosensing applications [4]. They support localized surface plasmons (LSPs) and present considerable advantages with respect to continuous layers. For example, the spectral resonance can be tuned not only by means of the dielectric material surrounding the nanoparticles but also by altering the size, shape, or distance between particles. Another advantage is that the electromagnetic field is strongly localized, a property that might lead to high spatial specificity sensing. In this way, several studies have shown the spectral shift of the optical response when varying the surrounding refractive index of the nanoparticles [5]. Our purpose in this work is to go beyond by introducing MO activity simultaneously to LPS excitation. To do so we will analyze the MO response of a series of Au/Co/Au nanodisks[6] as a function of the surrounding environment. Our preliminary results have shown that the MO measurements are more sensitive to dielectric changes than the optical ones. We expect to improve this result tuning the nanostructure geometrical parameters.

References:

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