Oral

MAGNETO-OPTICAL ACTIVITY EMERGING FROM PLASMONIC GOLD NANODISKS

J.B. González-Díaz[1], B. Sepúlveda[2], L. Lechuga[2], A. García-Martín[1], and G. Armelles[1]

[1]Instituto de Microelectrónica de Madrid, Consejo Superior de Investigaciones Científicas, C\Isaac Newton 8 (PTM) 28760 Tres Cantos, Spain
[2]Centro de Investigación en Nanociencia y Nanotecnología (CIN2) ICN-CSIC, Facultat de Ciencies, Campus UAB, 08193 Bellaterra, Spain

juanb@imm.cnm.csic.es

The excitation of surface plasmons has become very useful to enhance many other physical phenomena like surface enhanced Raman scattering (SERS), enhanced fluorescence emission, high harmonic generation or the magnetooptical Kerr effect (MOKE). If we focus on the latest subject, it has been shown the influence of surface plasmons on the enhancement of the magnetooptical (MO) actitivity for single ferromagnetic nanoparticles[1], or more recently for combined noble metal-ferromagnet nanofilms and nanodisks[2,3].

Up to now, this kind of systems has needed the incorporation of a ferromagnetic metal or a garnet, due to their high MO response at very low magnetic fields. No attempt has been performed for other materials as the field required to obtain such response is extremely high (more than 100T). However, the excitation of a surface plasmon in a metal could lead to the apearance of MO activity even for low magnetic fields. This is the scope of this work, where we present for the first time the MO response of a series of pure gold nanostructures. The emergence of MO effects in pure plasmonic nanostructures may then find important applications in plasmonic modulators or in the improvement of the biosensing performance of metal nanostructures [5].

We apply a magnetic of 0.8T to analize the Kerr rotation and ellipticity of disordered gold nanodisks and nanoholes obtained from continuous gold films grown over a glass substrate using colloidal lithography. We show that the MO response is controlled by the surface plasmon excitation, its spectral position depending on the aspect ratio of the particles/holes. Figure 1 show this dependence compared to a bare glass film. A peak and a S-like structure for the Kerr rotation and ellipticity respectively appear at the same energy region where the surface plasmon is excited. As the diameter of the nanodisks/holes increases, these features shift to lower energies (higher wavelengths), in accordance with the modification of the spectral position of the plasmon excitation due to the variation of the aspect ratio.

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References:

[1] J.B: Gonzalez-Diaz et al. Adv. Mat. **19**, (2007) 2643
[2] J.B. Gonzalez-Diaz et al. Phys. Rev. B. **76**, (2007) 153402.
[3] J.B. Gonzalez-Diaz et al. SMALL, **4**, (2008) 202.
[4] B. Sepulveda, et al., Opt. Lett. **31** (2006) 1085-1087.

Figures:

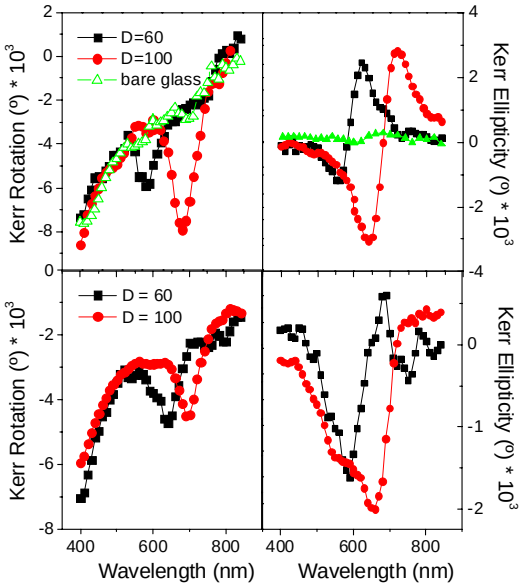

Fig. 1: MO Kerr rotation and ellipticity of gold nanodiscs (up), and nanoholes (down)