**Optical Near-Field Characterization of Plasmonic and Magnetoplasmonic Nanostructures**

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Most plasmonic devices are passive devices since their electromagnetic properties depend mainly on fixed properties such as the shape of the structures, their constitutive materials, and the dielectric media. A way to turn plasmonic devices into active ones is to use ferromagnetic metals, since due to their magneto-optical (MO) activity the optical response when applying an external low magnetic field can be modified. Unfortunately, plasmon resonances are critically broadened in ferromagnetic materials due to their important electromagnetic losses. An alternative is to combine ferromagnetic materials with noble metals. Recently, we have demonstrated that Au/Co/Au nanodisks exhibit enhanced magnetoplasmonic properties such as a significant increase of the MO activity when the localized surface plasmon (LSP) resonance is excited [1,2].

Understanding the interplay between the LSP excitation and the MO activity is relevant from both fundamental and technological viewpoints. A path to this comprehension is to correlate the behavior of the LSP induced electromagnetic field and the MO activity. It has been clearly shown that the increase of MO activity is related to the enhancement of electromagnetic field penetrating into the Co layer [2]. In that way, the goal of this work is to characterize the distribution of the near field at the surface of the nanostructures as a function of their morphologies but also as a function of the position and the size of the ferromagnetic layer. This study is achieved by combining Scanning Near-field Optical Microscopy (SNOM) with far-field optical and MO characterization as well as with FDTD simulations (see Figure). The lasers used to perform near field experiments and the LSP resonance of structures must have their wavelength close enough to couple efficiently the light with the LSP. Our studies concerning Au and Au/Co/Au nanostructures will be presented and compared to recent results [3-5].

**References**

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**Figures**

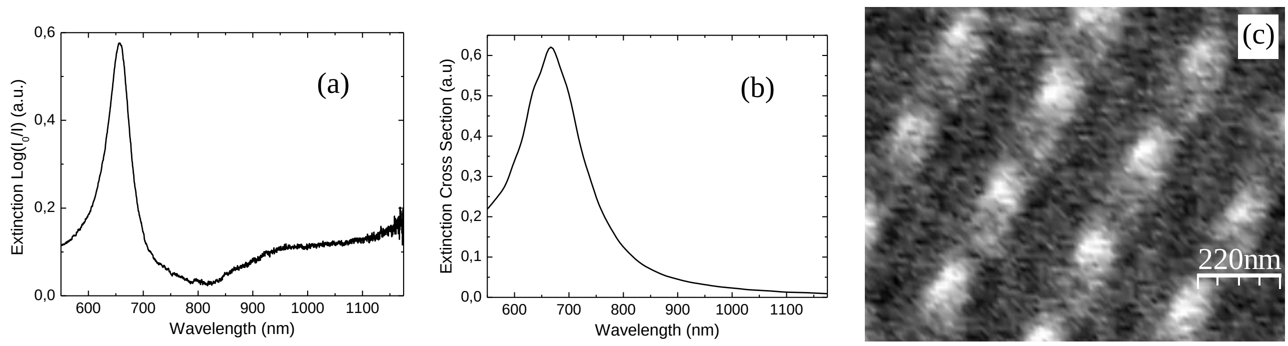


Fig.: (a) Extinction spectra and (b) simulated cross section for Au nanodisks (h=60nm, d=120 nm); (c) SNOM image in illumination mode of an array of Au nanostructures.