

## MASTER IN PHOTONICS – PHOTONICS BCN EUROPHOTONICS-POESII MASTER COURSE

### PROPOSAL FOR A MASTER THESIS

Dates: April 1<sup>st</sup>, 2017 - September, 30<sup>th</sup> 2017

**Laboratory:** Institut de Ciència de Materials de Barcelona ICMAB-CSIC

**Institution:** Consejo Superior de Investigaciones Científicas (CSIC)

**City, Country:** Bellaterra, Spain

**Title of the master thesis:** Optical Characterization of Plasmons Propagating along Magnetic/Ferroelectric Interfaces

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### Summary of the subject (maximum 1 page) :

Our laboratory is focused on the study of light and its interaction with matter [1-5]. This is a burgeoning field, especially regarding potential applications for information technologies. For instance, the relentless progress in optical communications, either in long-distance Internet networks or in the nanoscale range of on-chip communications, requires the development of new materials to control the flux of light. In this context, the exploitation of plasmonics opens new avenues to design systems that, using light, can be used more efficiently to control the flux of information along optical channels. One of the goals is to allow the propagation of light along one direction and forbid along the reverse path, i.e., optical isolation in nanoscale paths.

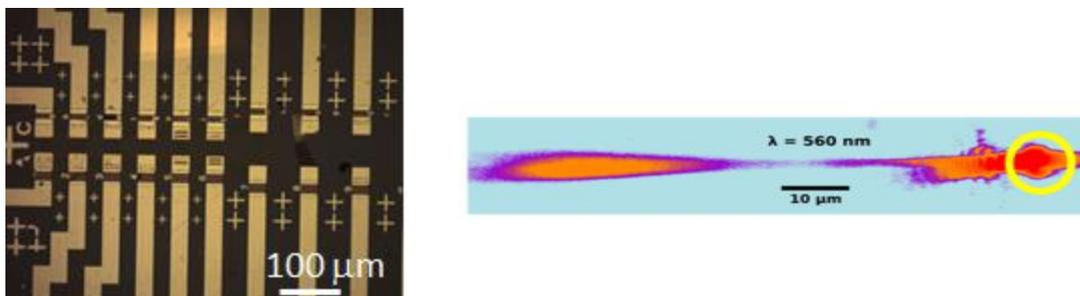


Fig 1. (Left) Optical micograph of some of the plasmonic devices designed in our lab using optical and e-beam lithography. (Right) Direct visualization of a plasmon propagating along an Au/glass interface taken in our leakage radiation microscopy laboratory.

In this master we propose an experimental research that aims at achieving modulated plasmon propagation using magnetic and ferroelectric materials. For that purpose, we propose hybrid dielectric-metallic complex structures as a further complementary path to exploit photonic/plasmonic effects, aiming at manipulating optical signals with magnetic/electric fields at the desired light frequencies. The successful candidate will be trained in state-of-the-art optical spectroscopy as well as diffraction-limited imaging and e-beam/optical nanolithography (see Figure 1). For recent references visit our site <http://www.icmab.es/mulfox/>

- [1] M. Rubio-Roy et al., *Langmuir*, 28, 9010 (2012);
- [2] J.M. Caicedo et al., *ACS Nano*, 5 2957 (2011);
- [3] O. Vlasin et al., *Phys. Rev. Applied.* 2, 054003 (2014),
- [4] O. Vlasin et al., *Scientific Reports* 5 15800 (2015).
- [5] B. Casals et al., *Phys. Rev. Lett.* 117, 026401 (2016)

**Keywords : Plasmonics, Magnetism, Ferroelectricity**