

In the last decade, and driven by the strong development of nanotechnology, there has been an increased interest in the study of the peculiarity of light interaction with metallic magnetic nanostructures. It was found that tailor designed nanostructured magnetic materials, named magneto-optical metamaterials, offer unique means to control propagation, localization, and polarization of light at the nanoscale. These unique properties arise from the excitation of an enhanced electrodynamics, called plasmon resonance, under appropriate illumination conditions (light wavelength and polarization). On the other hand, the excitation of a plasmon resonance can be used for the efficient harvesting and subsequent heat conversion of the energy of carried by the electromagnetic radiation leading to the photo-induced heating of nanostructures, referred to as thermoplasmonic heating. Thermoplasmonic heating enables the optical manipulation of the local magnetic properties.

The goal of this Master project is to design, create, and model novel metamaterials combining ferromagnetic and noble metal nanostructures with designed and tunable magnetic and optical properties.

To this purpose, advanced modeling tools based on electromagnetic theory, which has been specifically devised to deal with nano-scale optical objects, will be utilized for the design of the metamaterials in the first part of the Master project. Subsequently, selected metamaterials will be created using the modern nano-lithography tools available in the Center, and their optical and magnetic properties, as well as their mutual dependence, investigated using advanced tools also available at CIC nanoGUNE.

Such multifunctional magneto-photonic metamaterials are not only of substantial scientific, but also technological interest since they are currently under intense exploration for ultrasensitive molecular sensing applications, opto-activated nanomagnetic logic devices, and ultrathin optical meta-devices.

Description of the research group:

The **nano-magnetism Group** at CIC nanoGUNE is conducting world-class basic and applied research in the field of magnetism and optics in nano-scale structures. The Group staff has a longstanding expertise and proven track record in fundamental and applied aspects of nano-magnetism and nano-photonics.

Application:

If you are a master student and you are interested in this project, please get in touch with the scientist in charge: **Paolo Vavassori** (p.vavassori@nanogune.eu).

To apply for a master scholarship fill in the form below and follow the instructions and recommendations of the general call (**open until 30 June 2022**).

NOTES:

(i) All applicants will receive an answer after the end of the selection process; but please note that due to the large number of submissions that are expected, we cannot provide individual feedback.

(ii) Additional information about nanoGUNE's commitment towards HR excellence in Research and Gender Equality are available on our website.

(iii) We encourage you to subscribe to our HR mailing list to receive information related to nanoGUNE's open positions and open calls for different training and talent attraction programs.