Magnetoplasmonics: combining magnetic and plasmonic functionalities.

A. Cebollada, G. Armelles, A. García Martín, M.U. González, D. Meneses-Rodríguez, F.García, and J.C.Banthí.
IMM-Instituto de Microelectrónica de Madrid (CNM-CSIC)
Isaac Newton 8, PTM, E-28760 Tres Cantos, Madrid, Spain.
alfonso@imm.cnm.csic.es

Abstract

Nanosystems with combined magnetic and plasmonic functionalities have in recent years become an active topic of research [1]. By an adequate internal architecture of the constituting components, the magneto-optical activity of these systems can be largely increased due to the electromagnetic field enhancement associated with the plasmon resonance. Simultaneously, the magnetic functionality permits the control of the plasmonic properties by an external magnetic field, which allows the development of active plasmonic devices. Magnetoplasmonic structures find applications for example in gas and biosensing areas and in integrated photonic devices for telecommunications.

After an introductory review of the current understanding on this topic, I will make special emphasis on the phenomenology that metal-dielectric magnetoplasmonic nanodisks present. These systems may exhibit two modes [2] of magnetic and electric dipolar character due to the interaction between the disks, coupling to the incident light in a different way, and giving rise to regions with low and high optical extinction. In this scenario, the insertion of a ferromagnetic component inside the structure introduces magneto-optical activity in the system [3]. The effect that the diferent constituent parameters have on the optical and magneto-optical properties of these systems will be discussed in detail.

[1] G.Armelles et al., Advanced Optical Materials **1** (2013) 10.
[2] A.Dmitriev et al., Small **3** (2007) 294.
[3] J.C.Banthi et al., Advanced Materials, **24** (2012) OP36.