

Magnetic properties of magnetoplasmonic crystals based on commercial digital discs

V. Belyaev,¹ V. Rodionova,¹ K. Chichay,¹ A. Grunin,² and A. Fedianin²

¹*Immanuel Kant Baltic Federal University,
A. Nevsky 14, Kaliningrad, Russia*

²*Lomonosov Moscow State University,
Leninskie Gory 1, Moscow, Russia*

Several topics of photonic are targeted on the enhancement of magneto-optical response in nanostructures. One of such approaches is creating magnetoplasmonic crystals (MPC) based on digital discs with ferromagnetic film. It is necessary to investigate in-plane anisotropy of MPCs and influence of ferromagnetic layer to improve the quality factor of plasmons. MPCs based on Fe and Ni were investigated using VSM by LakeShore and a step-like behavior of hysteresis loops in case of transverse plasmon propagation way was observed. Measurements along the plasmon propagation way showed near-rectangular hysteresis loops typical for Ni-based thin films. In-plane anisotropy was found in Ni thin films on Si/SiO_2 substrate, too. All Fe structures had isotropic in-plane magnetic properties.

In-plane anisotropy for Ni on Si/SiO_2 can be explained by magnetostriction properties of Ni. For MPCs it can be explained as a result of interaction between different factions of Ni that partly covered sides of the substrate battlements.