Poster

EXPERIMENTAL AND COMPUTATIONAL ANALYSIS OF THE ANGULAR DEPENDENCE OF THE HYSTERESIS PROCESSES IN AN ANTIDOTS ARRAY

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Patterned magnetic nanostructures offer the possibility of analyzing the interrelation structure-hysteresis in well-controlled samples from the structural point of view[1]. We present an experimental and simulational study of the anisotropy and of the angular dependence of the hysteresis processes of a micron-sized antidots array lithographed on a continuous Fe/GaAs(001) epitaxial thin film grown by Molecular Beam Epitaxy (MBE). The structural characterization has been done by X-ray diffraction and the measurements have been carried out by means of magnetooptic kerr effect (MOKE) with a laser beam collimated to 0.4mm diameter. Although the coercivity increases in the array with respect to that of the continuous film area, the first order magnetic anisotropy, obtained from transverse susceptibility (TS) measurements[2], also carried out by MOKE techniques, is very close to the Fe bulk value. Two irreversible magnetization jumps are evident with switching fields Hs_1 and Hs_2. We also used several micromagnetic models to get insight into the specific reversal mechanism of each sample.

We have measured the angular dependence of the hysteresis loops in the array and we have seen that the antidot array conserve most of the characteristics of the continuous film with some difference like that the ratio M_r/M_s is smaller and the coercivity is two or three times larger in the array, also the two switching fields typical of the four-fold Fe cubic anisotropy is preserved. The values of the switching fields are consistent with a micromagnetic model where two domain walls exist in the exterior (non-lithographed) region.

References:

[1] J.I. Martín et al., J. Magn. Magn. Mater., **256** (2003) 449.
[2] F. Cebollada et al., Phys. Rev. B., **66** (2002) 174410.