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Novel magnetic nanomaterials: patterned antidots, T-shaped nanostructures and nanopillars

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In this talk, three different nanomaterials are studied:
i) Patterned Antidots.
Co/Permalloy hard-soft bilayer thin films have been perforated by focused ion beam with long-range order arrays of nanoholes with hexagonal or square symmetries. The magnetic coercivity can be tailored depending on the relative thicknesses between Co and Permalloy. Magnetic Force Microscopy (MFM) imaging shows striking qualitative differences between the two symmetries: square symmetry arrays have inhomogeneous magnetic state and a high density of super-domain walls, whereas hexagonal symmetry arrays show a homogeneous magnetic configuration [1].
ii) T-shaped nanostructures manufactured by electron beam lithography with a lift-off process.
This geometry exhibits strong configurational anisotropy, so four stable magnetic states had been predicted. The existence of such four states is proven by MFM and micromagnetic simulations, thus confirming that two bits of information can be stored. How to write and read those bits is also addressed [2].
iii) Nanopillar arrays fabricated by glancing angle deposition with magnetron sputtering (MS-GLAD).
It is shown that MS-GLAD is an easy and versatile route to fabricate nanostructured films with magnetic nanopillars in large areas in a single processing step. In particular, vertical or tilted nanopillars can be fabricated depending on whether the substrate is kept rotating azimuthally during deposition or not, respectively. The magnetic properties of these films can be tuned with the specific morphology [3].
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Reference list
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