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Structural and magnetic properties of $L1_0$ FePt/{MgO, W, or Pt }/$L1_0$ FePt trilayers

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Abstract: Nowadays there is an urgent need for enhancing data storage capacity of hard disk drives due to the rapid increase of digital data volume produced worldwide. New effective approaches are required to push the recording areal density beyond the limit of 1 Tbit/in^2 of state-of-art hard disk drives. A promising alternative is 3D-magnetic recording, where stacking magnetic layers with different magnetic properties are used [1].

In this work we report on the morpho-structural and magnetic properties of FePt/interlayer (MgO, Pt or W) /FePt magnetron sputtered trilayers, as a base structure towards 3D magnetic recording systems. The stack is grown on an MgO (100) substrate and consists of two magnetically hard FePt layers with a thickness of 20 and 10 nm separated by an interlayer of variable thickness (5 up to 50 nm). Fig 1a summarizes the coercivity for all MgO, W or Pt interlayer samples; the layers seem to be coupled even at 20 nm of MgO or W interlayer thickness. However, at 5 nm interlayer thickness, hysteresis loops for W or MgO interlayers are those of a film stack of partially coupled ferromagnetic layers(Figure 1b), whereas a fully decoupled magnetic trilayer is obtained for a Pt interlayer, in agreement to previous reports [2] and also supported by magnetic force microscopy imaging. Finally, electron diffraction patterns and dark field images analysis indicate that most of FePt grains grow in the $L1_0$ phase with the (001) planes parallel to the substrate and the MgO interlayer grows oriented as the substrate.

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REFERENCES
[1] N. Amos *et al.* PLoS ONE **7** e40134 (2012)
[2] A. P. Mihai *et al.* Appl. Phys. Lett. **94** 122509 (2009); O. P. Pavlova *et al.* Appl. Surf. Sci. **266** 100 (2013)

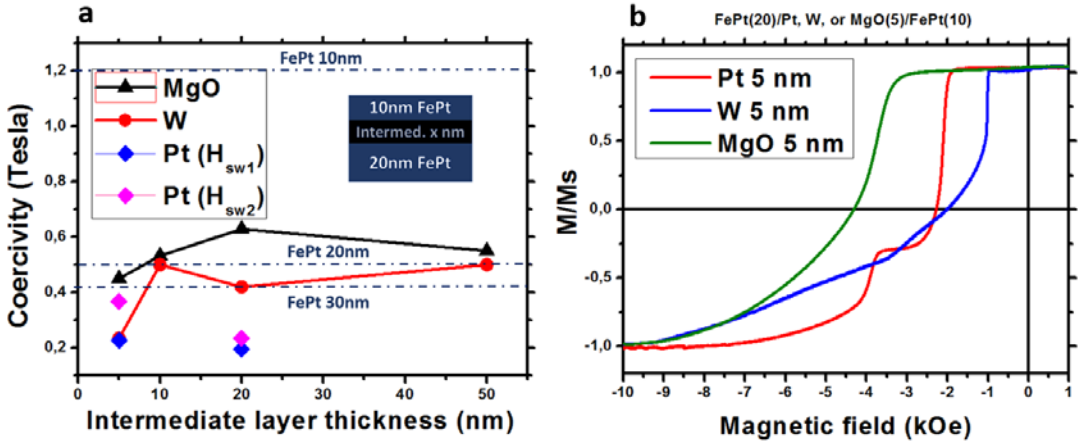

Figure 1a. Magnetic coercivity of the studied trilayers as a function of the interlayer thickness. **b.** Hysteresis loops of FePt (10 nm)/ W, MgO, Pt (5 nm)/FePt (20nm) samples. In the case of Pt interlayer, the magnetic layers are decoupled, whereas in trilayers with MgO and W a coupling behaviour was observed.