

GROWING UP OF MAGNETIC NANOSTRUCTURES BY EBL USING DOUBLE LAYER RESIST SYSTEM AND CHARACTERIZATION BY AFM AND MAGNETO OPTICAL SNOM.

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The fabrication of patterned thin films with nanometric structures using electron beam lithography (EBL) has problems with the sharpness and the form of the defined nanoelements. It occurs because the edges of the patterns are touching the resist used to write the form, so that, when the resist is removed in the lift-off process, some times it cannot be completely cleaned as it is adhered to the nanostructures edges. To solve this problem samples can be prepared with a “two layer system” of different resists. The sensibility of both resins to electrons is different and, as a consequence, when the deposition is performed, the edges of the nanostructures are not in contact with the resin, avoiding the adhesion effects.

In this work we have evaluated this technique applying it to fabricate rings grown-up with cobalt. The study of these nanometric magnetic systems has now a great interest from their possible applications in memories, and from basic research point of view as they present several stable magnetic configurations.

The structural characterization has been done using AFM and SEM techniques (Fig.1). These images shows that, actually, the fabricated nanostructures do not present particles of resist remaining at the edges of the rings. Also, the profiles across the ring section have been analyzed by AFM in order to obtain the appropriate dose in the EBL process for fabrication of high quality edges. The magnetic properties of the rings[1] were studied using a Scanning Near Optical Microscopy (SNOM)[2] system that allows to perform transversal magneto optical Kerr effect (TMOKE [3]) measurements. The hysteresis loops show the great difference between the coercive field of continuous film and the Co rings, as the former has about 5 times lesser coercive field than the latter (Fig.2).

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References:

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Figures:

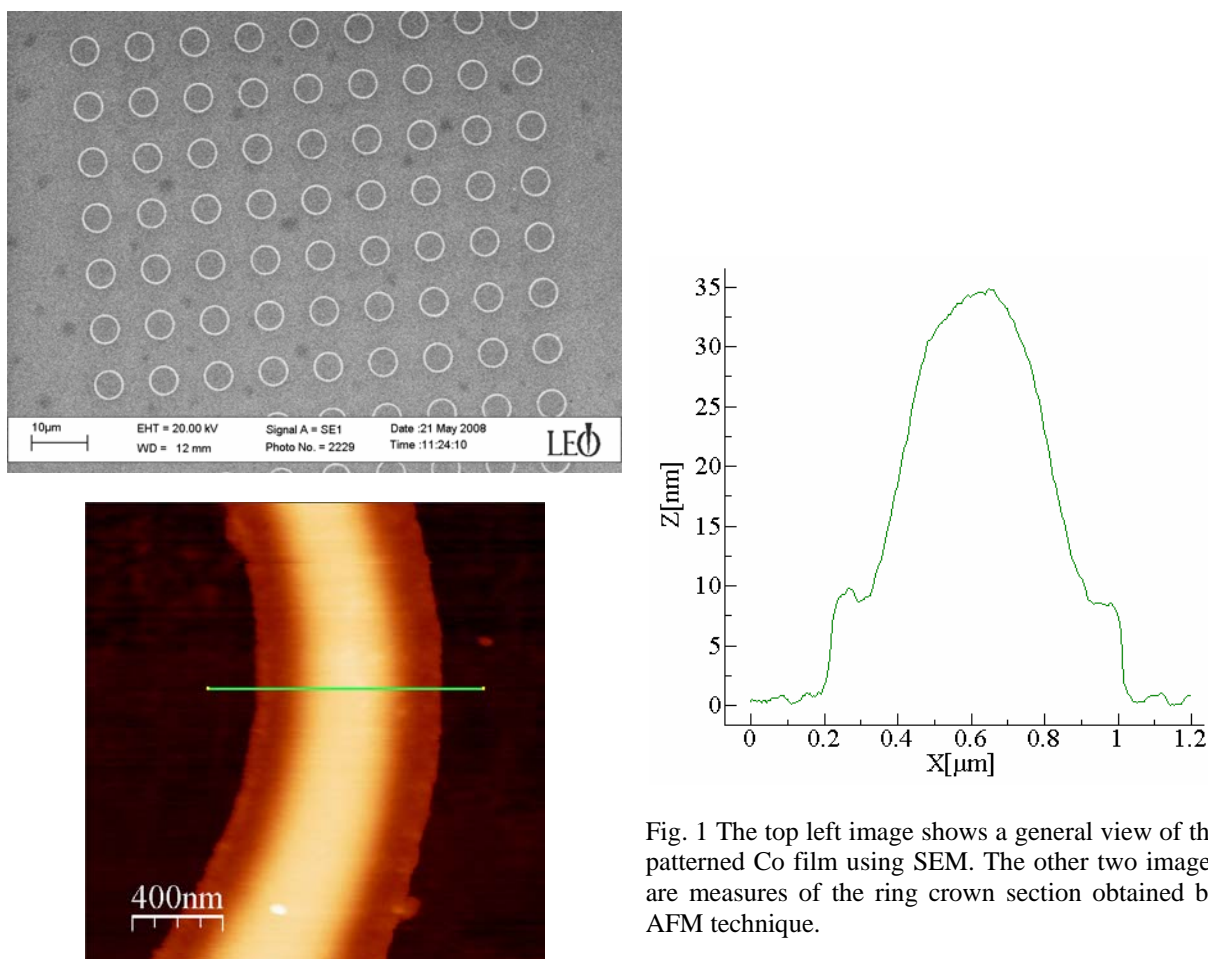


Fig. 1 The top left image shows a general view of the patterned Co film using SEM. The other two images are measures of the ring crown section obtained by AFM technique.

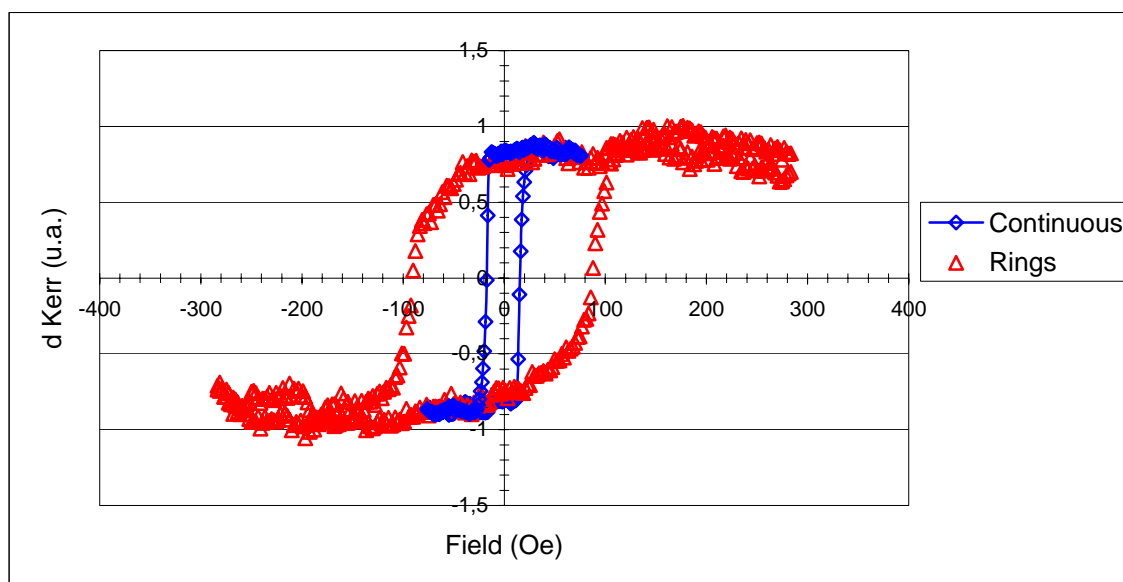


Fig. 2 TMOKE measurements performed by SNOM in the continuous thin film (diamonds) and the Co nanostructured rings (triangles).