One step FEBID fabrication of Co based magnetic nanotubes

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Focused electron beam induced deposition (FEBID) is a well-known direct-writing technique that has been widely studied in the last decades due to its versatility as micro and nano-fabrication tool [1, 2]. Most recently, the deposition in parallel of two different precursors has also called the attention of several researchers in order to grow binary alloys [3-6]. In these alloys the relative flux of the two precursors was varied in order to tune the bulk composition and confer to the deposits different electric and magnetic properties.

In this work, binary systems of Co-SiO_x in a carbonaceous matrix has been deposited using dicobalt octacarbonyl ($Co_2(CO)_8$) and tetraethyl orthosilicate ($Si(OC_2H_5)_4$) precursors. Planar cross-sections of deposited pillars were prepared and the composition distribution was investigated by energy dispersive X-ray spectroscopy (EDX) maps. Magnetic characterization was performed by Lorentz microscopy.

Results showed a non-homogeneously distributed composition inside the FEBID pillars but a symmetric radial distribution, as can be seen in Figure 1a) where the EDX map of the cobalt element in showed. Moreover, Lorentz microscopy showed a magnetic behaviour localized on the areas with the highest cobalt content, see Figure 1b).

Hence, we report in this work a single step nanofabrication process of magnetic nanotubes.

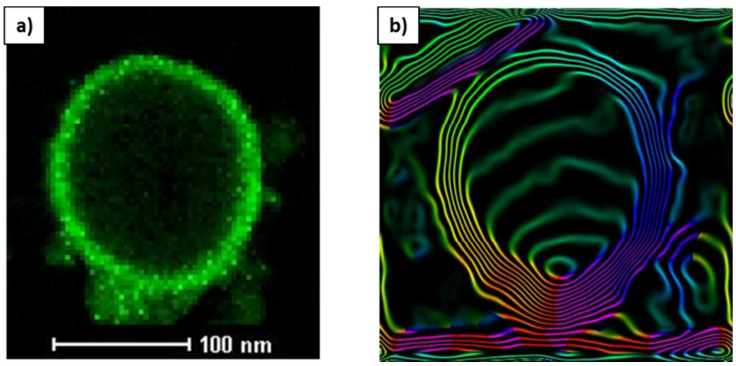

Figure 1. a) EDX map of Cobalt distribution on the pillar and b) contour lines showing the magnetic flux distribution in the pillar.

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