

SEMINARIO

Instituto Nicolás Cabrera

Día: *Viernes, 17 de Junio de 2016*

Hora: 12h30

Lugar: Departamento de Física de la Materia Condensada, Facultad Ciencias, Módulo 3, aula de Seminarios (5ª planta)

Programa:

Presentación a cargo de Rosa Córdoba Castillo (: Instituto de Ciencia de Materiales de Aragón (ICMA). CSIC-Universidad de Zaragoza).

Título: *Patterning Functional Nanostructures by Focused Beams Induced by Processing.*

Abstract: Focused electron- and ion beams in combination with specific chemistry can be used for direct-writing of nanostructures at the three dimensions of space [1–5]. Doing so with magnetic materials provides an appealing route towards explorative research on future magnetic storage and spintronic technologies [6].

However, patterned materials often lack purity and/or proper functionality. The low metallic content in these deposits is caused by the incomplete precursor molecule dissociation and the lack of volatile products resulting from this process. That is why for the nanofabrication of binary systems and novel magnetic nanostructures new approaches are required.

Here, we report two examples of functional nanostructures patterned by focused electron beam (FEB) induced processing. Firstly, we introduce a method to synthesize nickel-based deposits [7]. Our procedure consist of two sequential in situ steps at room temperature to further tune the deposited nickel-based structures. The 1st step: Ni grown by focused electron beam induced deposition (FEBID) and the 2nd step: FEB irradiation of the Ni FEBID under O₂ flux at room temperature. By using this method, as-grown Ni deposits are transformed into homogeneous NiO deposits. Proof-of-concept studies will be shown in which NiO deposits could display resistance switching, and so-called exchange-bias behaviour in NiO-Co bilayers, fully made by FEB processing. Second, we report a study on the magnetic switching behavior in a novel set of magnetic nanostructures. We manipulate the magnetization reversal in Fe FEBID nanostructures varying the 'scanning strategy' of the FEB. In particular, by changing the beam overlapping in one direction during the e-beam writing process, we introduce a subtle thickness modulation, enabling a new way to manipulate the local anisotropy and the nanomagnet's switching field due to changes in magnetostatic interactions [8].

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- [3] Lavrijsen R et al., 2011 *Nanotechnology* 22 25302
- [4] Córdoba R 2014 *Functional Nanostructures Fabricated by Focused Electron/Ion Beam Induced Deposition* (Springer International Publishing)
- [5] Rodríguez L A et al., 2015 *Beilstein J. Nanotechnol.* 6 1319–31
- [6] Parkin S S P, Hayashi M and Thomas L 2008 *Science* (80-.). 320 190–4
- [7] Córdoba R et al., 2016 *Nanotechnology* 27 065303
- [8] Córdoba R, Han D-S and Koopmans B 2016 *Microelectron. Eng.* 153 60–5

