

## Domain Wall dynamics in permalloy nanowires with ferromagnetic chemical barriers

S. Ruiz-Gómez<sup>1</sup>, C. Fernández-González<sup>2</sup>, Michael Foerster<sup>1</sup>, Lucía Aballe<sup>1</sup>, Juan de la Figuera<sup>3,4</sup>, Adrián Quesada<sup>5</sup> and Lucas Pérez<sup>2,6</sup>.

<sup>1</sup>Alba Synchrotron Light Facility, CELLS, E-08280, Bellaterra, Spain.

<sup>2</sup>IMDEA Nanociencia, 28049, Madrid, Spain.

<sup>3</sup>Unidad Asociada IQFR (CSIC)-UCM, 28040, Madrid, Spain

<sup>4</sup>Instituto de Química Física "Rocasolano" CSIC, 28006, Madrid, Spain

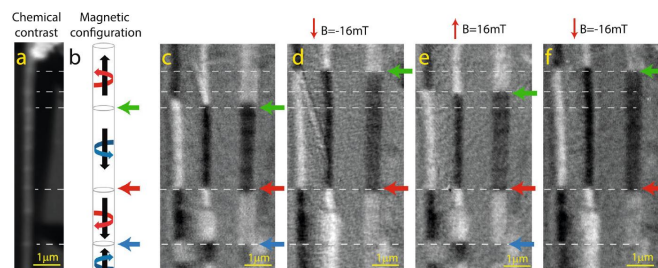
<sup>5</sup>Instituto de Cerámica y Vidrio, ICV-CSIC, 28049, Madrid, Spain

<sup>6</sup>Departamento Física de Materiales, Universidad Complutense de Madrid, 28040, Madrid, Spain.

Email: [claudia.fernandez@imdea.org](mailto:claudia.fernandez@imdea.org)

Magnetic properties of nanowires have got the attention of many scientific researchers due to the applicability in spintronic devices as the case of racetrack memories. Designed by Stuart Parking [1], this new prototype of memories arise to deal with the big data problem and looks for the development of new 3D storage technology which allow to improve the recording capacity and the efficiency of the recording and reading processes. The performance of these memories is based on the control and the stabilization of magnetic domain walls (DWs) using spin-polarized currents or magnetic fields [2]. These devices are still a prototype and to be able to fabricate them in a 3D configuration it is necessary to design nanowires with local pinning sites for domain walls and to study the domain wall configuration and behavior under applied field.

In this work, we study the magnetic configuration of permalloy nanowires ( $\text{Fe}_{30}\text{Ni}_{70}$ ) with chemical barriers with composition  $\text{Fe}_{80}\text{Ni}_{20}$  using a Photoemission Electron Microscope (PEEM). We introduce chemical variations along the length of the nanowire with the aim of acting as local pinning sites of DWs. We checked the chemical structure with X-ray absorption spectroscopy (XAS-PEEM). X-ray magnetic circular dichroism (XMCD-PEEM) experiments have been done to study the magnetic configuration of the nanowires and the domain wall dynamics under the application of a magnetic field along the nanowire axis. Fig 1 shows the results of these experiments. We have found that chemical barriers act as local pinning sites for the domain wall motion as well as the first experimental evidence of the stabilization of a topologically protected state of a DW [3].



**Figure 1.** (a) Chemical contrast image for a nanowire with chemical barriers. (b) Magnetic configuration of the nanowire. XMCD images FeL<sub>3</sub>-edge for the same wire before (c) and after (d-f) applying a magnetic field sequence of -16mT.

### References

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