

Ordered arrays of electrodeposited Ni nanowires and nanotubes: comparing magnetic properties

Mariana P. Proenca^{1,2}, Célia T. Sousa¹, João Ventura¹, Manuel Vazquez², João P. Araujo¹

¹*IFIMUP and IN – Institute of Nanoscience and Nanotechnology, Rua do Campo Alegre 687,
4169-007 Porto, Portugal*

²*Instituto de Ciencia de Materiales ICMM – CSIC, Campus Universitario 28049 Cantoblanco
Madrid, Spain*

High aspect ratio Ni nanowires (NWs) and nanotubes (NTs) were electrodeposited inside ordered arrays of self-assembled pores (~50 nm in diameter and ~50 μm in length) in anodic alumina templates by a potentiostatic method. The current transients monitored during each process allowed us to distinguish between NW and NT formation. The overfill process was found to occur in two steps when depositing NWs and in a single step in the case of NTs. A comparative study of the morphological, structural and magnetic properties of the Ni NWs and NTs was performed using a scanning electron microscope, X-ray diffractometer and vibrating sample magnetometer, respectively. Magnetization reversal processes were studied measuring hysteresis loops at different angles of applied external magnetic field. Magnetization in NW arrays was found to reverse by means of the nucleation and propagation of a transverse wall, while for NT arrays a non-monotonic angular dependent coercive field was observed, evidencing a transition between the vortex and the transverse reversal mode.