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Vortex dynamics in YBCO films with engineered antidots and ferromagnetic Nanostructures A. PALAU, V. ROUCO, J.C. GONZÁLEZ, C. MONTON, T. PUIG, X. OBRADORS, Institut de Ciència de Materials de Barcelona CSIC, Bellaterra, Spain, R. CÓRDOBA, J.M. DE TERESA, Instituto de Nanociencia de Aragón, Univ. Zaragoza, E-50009, Spain — Understanding vortex pinning mechanisms and the interaction between vortices and defects is still one of the major goals to enhance properties of nanostructured superconductors. We have used high resolution lithography techniques (FIB, EBL and C-AFM) to create artificial pinning sites in YBCO films. Model systems with antidots and blind antidots with different geometries, distribution and density have been generated. Moreover, with the aim to study interactions in hybrid superconductor-ferromagnetic systems we have filled the antidots with cobalt rods by focused electron beam induced deposition. In-field critical current measurements have been performed in a wide temperature (T) and magnetic field (H) range in order to study vortex dynamics in these novel systems. As far as YBCO films with blind antidots, collective guided vortex motion is observed when we generate spatial asymmetric (ratchet) pinning potentials. By tuning H and T, the vortices undertake the single vortex pinning to vortex-vortex interaction transition which determines the region where the ratchet effect is activated. As far as YBCO films with ferromagnetic rods, we demonstrate a clear interaction between the magnetic field generated by the cobalt nano-rods and the superconducting matrix.

A. Palau
Institut de Ciència de Materials de Barcelona CSIC, Bellaterra, Spain

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