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Magnetic properties of micro-patterned array of anti-dots in Co/Ni bilayer

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Large-area micropatterned array of Co/Ni bilayer anti-dots was fabricated using photolithography and wet etching process. The surface morphology as well as the surface topography was checked by scanning electron microscopy and atomic force microscopy, whereas the magnetic properties were studied by magneto-optical Kerr effect (MOKE) and magnetic force microscopy (MFM). Systematic studies of the magnetic-reversal mechanism, the in-plane anisotropy and the switching field properties were carried out. To get a comprehensive knowledge about the domain configuration, we also employed OOMMF simulations. It was found from the MOKE measurements that a combined effect of configurational and the magneto-crystalline anisotropy simultaneously works in such micropatterned bilayer structures. In addition, the inclusion of holes in the uniform magnetic film drastically affected the switching field. The MFM images show well-defined domain structures which are periodic in nature. The micromagnetic simulations indicate that the magnetization reversal of such a structure proceeds by formation and annihilation of domain walls, which were equally manifested by the field-dependent MFM images. The observed changes in the magnetic properties are strongly related to both the patterning that hinders the domain-wall motion and to the magneto-anisotropic bilayered structure