

TUNING MAGNETIC ANISOTROPY OF Co NANOPARTICLES BY METAL CAPPING: AN XMCD STUDY

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We have previously studied the magnetic properties of nanometric Co clusters (from 1 to 5 nm) in insulating and metallic matrices [1] prepared by sequential sputtering. We have demonstrated that magnetic anisotropy of Co clusters is significantly larger than in bulk and strongly increasing with decreasing cluster size. Moreover, capping the cluster by a metallic (M = Cu and Au) layer increases both the cluster magnetic anisotropy and the orbital to spin ratio of Co moments at the surface. These enhancements are probably caused by hybridization of Co and M atoms at the interface. In order to investigate such effects, we have performed X ray Magnetic Circular Dichroism (XMCD) experiments at the L_{2,3} edges (i.e. d levels are probed) and at the K edges (sp bands) of Au, Co and Cu atoms. These element and shell selective experiments show a similar polarization of Cu and Au as previously observed in Co/M multilayers, as indeed had been theoretically predicted [2]. Both Cu-3d and Au-5d bands are ferromagnetically coupled to the Co 3d levels. Applying sum rules spin, orbital and total magnetic moments of Au, Co, and Cu are determined. The effects of the hybridization on the Co surface atoms are also investigated.

[1] F. Luis et al., Phys. Rev. B 65, 094409 (2002) ; F. Bartolome et al. J. of Magn. & Mag. Mat. 272-276 (2004) e1275; F. Luis et al., J. of Applied Physics *in press* (2006).

[2] S. Pizzini et al., Phys. Rev. Lett. 74, 1470 (1995) ; M.G. Samant et al. Phys. Rev. Lett. 72, 1112 (1994) ; F. Wilhelm et al., Phys. Rev. B 69, 220404(R) (2004)

TOPIC III. Mechanical, magnetic, transport and optical properties.

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