Spin Reorientation in Thin Au/Co/Au Films: *in-situ* XMCD and EXAFS Study

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The preferred in-plane orientation of the magnetization in Co thin films can be switched to out-of-plane either by decreasing the thickness of the Co layer at fixed temperature, or the thickness of the Au cap layer, or by decreasing the temperature at fixed layer thickness. Recently, we have characterized the Co/Au system grown in-situ on a W(110) single crystal and found a novel behaviour, where a SRT can be observed over a wider range of Co thicknesses, depending on temperature and cap-thickness. Furthermore, we found a competing situation where the system was possible to stabilize both with an in-plane and an out-of-plane remanent magnetization for very thin Co layers. Our recent in-situ XMCD work indicates (a) for thick Co films the magnetization remained fully in-plane upon capping with Au, for all Au cap thicknesses. In the thin limit of Co thickness (case b) immediately after capping with Au the magnetization turned fully out-of-plane, and the overall magnetization increased upon further adding of Au. XMCD results will be discussed regarding the magnitude of magnetic moments, and especially on how the orbital moment varies in all cases which we studied. In short our results indicate that in the case (a) no variation of the orbital moment took place upon reorientation, in contrast to case (b). These observations reveal a more subtle dependence of the magnetic energies on the real space structure and add novel possibilities in order to create novel canted magnetic phases not observed earlier by tuning the growth parameters of this system, beyond what is reported in the literature. Keywords: magnetic films, x-ray magnetic circular dichroism, XAFS