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Ultrathin Fe films have been investigated for their specific structure and magnetic properties in the ultrathin film range for a non magnetic substrates Cu(111). It has been shown that, related to the epitaxial growth and to surface diffusion one can produce a large variety of self organised and small sized clusters aligned and oriented along the steps of the vicinal surface (Cu(111) - vic 1.2°).
Moreover, in order to study the in-plane orbital and spin anisotropy of small clusters we have analysed the magnetic anisotropy of organised fcc Fe clusters aligned parallel to steps. From the structural point of view the Fe/Cu(111) system has been extensively studied [1] and recently completed in our group for the Cu(111) 5° miscut sample in the 0.1 ML - 0.5 ML range. In this case it is now well established that step decoration dominates the growth and that below 0.7 ML iron islands are aligned along the steps.
The mean question was (our previous work report -HE 759) could the symmetry break in the plane produce a large anisotropy in the orbital moment along different in-plane directions. Exchange will induce different spin magnetic moments along both non equivalent in-plane directions. Recent XMCD measurements were performed on this system where Curie temperatures and blocking temperatures as well as saturation field for small iron clusters on Cu(111) could be determined, but no in-plane variation has been performed in the previous experiment [2].
The set-up for in-plane azimutal measurements using XMCD at the $FeL_{2,3}$ edges was successfully implemented and tested on the 1.2° vicinal surface of Cu(111) by our group at ID12B. We clearly evidenced strong orbital in-plane anisotropy for the 0.7ML and 4 ML $Fe_{65}Ni_{35}$ alloy films (report -HE 759) whereas for the 0.7 ML and 4 ML Fe/Cu(111)-vic 1.2° no in-plane orbital moment anisotropy could be evidenced. The complete thickness dependence of the out of plane and in plane moments could be measured and shows that the fcc to bcc phase transition after 2ML relates to the magnetic moments of the iron. Comparatively to the fct $Fe_{65}Ni_{35}$ films the Fe films relaxes via a phase transition rather than tetragonalisation of the fcc structure. The measured orbital and spin magnetic moments are thus coherent with the evolution of in-plane isotropic fcc and bcc structures. The out of plane moments where measured and evidences the strong contribution of magnetocristalline anisotropy for all films studied.

[1] J. Shen et al. Phys. Rev. B56 (1997) 11134
[2] P. Ohresser et al. Phys. Rev. B62 (2000) 5803