ESRF	**Experiment title:** Induced 4d magnetic moments and magnetic anisotropy in 3d/4d TM multilayers and alloys probed by XMCD at $L_{2,3}$ edges.	**Experiment number:** *HE 224*
Beamline: ID12B	**Date of experiment:** from: 09/09/1997 to: 14/09/1997	**Date of report:** 19/02/98
Shifts: 15	**Local contact(s):** Marco Finazzi	*Received at ESRF:* - 3 MAR. 1998

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Report:

The Transition Metal (Fe, Co, Ni)/Pd systems display fascinating magnetic properties due to the 3d-4d band hybridization and *3d-4d* exchange interaction. In these experiments, we have measured using X-ray Magnetic Circular Dichroism (XMCD) the thickness dependence of the orbital and spin Fe magnetic moment in Fe/Pd multilayers.

The XMCD experiments, carried out at the ESRF beamline 6 (ID12B) were performed at 40 K under a magnetic field of 5 Tesla applied along the normal to the film plane, high enough to saturate the magnetic moment in all the multilayers. Fig 1 displays ,the dependence of the Fe total magnetic moment as a function of Fe film thickness. Up to 3ML, both magnetic moments are strongly enhanced ($m_{spin} \approx 3,1\mu_B$ and $m_{orb} \approx 0,26\mu_B$) compared to the bulk value. Then we remark a sudden drop of the total magnetic moment from about 3.1 μ_B below 3AL to 2.7 μ_B at 4AL of Fe. The orbital moment seems to be more affected during this variation as proved (not shown) by the reduction of the ratio m_{orb}/m_{spin}.

Above 4AL, the magnetic moments remain almost constant With $m_{spin} \approx 2.5\ \mu_B$ and $m_{orb} \approx 0.18\ \mu_B$ which means also an enhancement of both spin and orbital moment with respect to the reference sample. Note that even for the 16AL Fe multilayer, the bulk magnetic moments is still not recovered.

The strong increase for the thinnest Fe thickness is in excellent agreement with numerous calculations for Fe/Pd interfaces and thus clearly point out the important role of the 3d-4d band hybridization in this system. Apart from their influence on the Fe electronic structure (thus the magnetic properties), the Pd atoms at the interfaces also induce modifications on the stacking sequence of the Fe atoms i.e. their crystallographic structure. XANES experiments, previously done on similar, samples in LURE, reveal indeed a change from fcc structure below the critical thickness (Fe ≈ 4 AL) to bct above it. Our results show a clear correlation between structural and magnetic properties and we believe that we have synthesize the Fe fcc High Spin (HS) phase in our Fe/Pd multilayers. An article is in preparation.

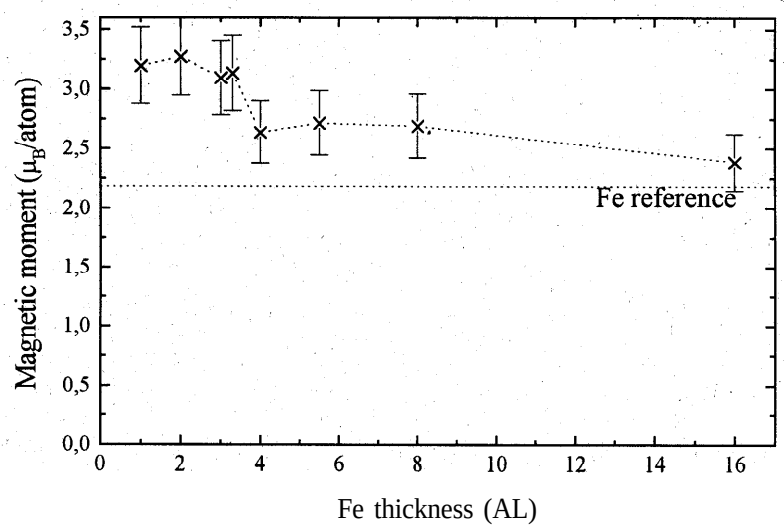

Figure 1 : Magnetic 3d moments of Fe versus the thickness of the Fe layer in Fe/Pd multilayers. The horizontal dashed line indicates the total magnetic moment measured on the Fe reference film.