ESRF	**Correlation between magnetic anisotropy and growth-induced chemical anisotropy in $CoPt_3$ thin film alloys investigated by XMCD.**	**Experiment number:** HE-129"
Beamline: ID12A	**Date of experiment:** from: 15/05/97 to: 16/05/97	**Date of report:** 29/08/97
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In this report, we present the results obtained from XMCD measurements using fluorescence yield detection (FY) at the Pt $L_{2,3}$ edges in both $CoPt_3$ thin film and bulk alloy. The bulk sample crystallizes in the cubic $L1_2$ structure and the thin film was deposited at 690K onto a sapphire substrate, following the growth of a 150Å Ru (0001) buffer. For this epitaxial fcc (111) thin film, an uniaxial magnetic anisotropy of the order of $1\ 0^7$ erg. cm^{-3} (unexpected for a cubic lattice) as well as 100% perpendicular remanence are found and are correlated with the existence of a compressive strain resulting from preferential heteroatomic correlations oriented along the growth direction (11 I), driven by both Pt surface segregation and associated surface diffusion.

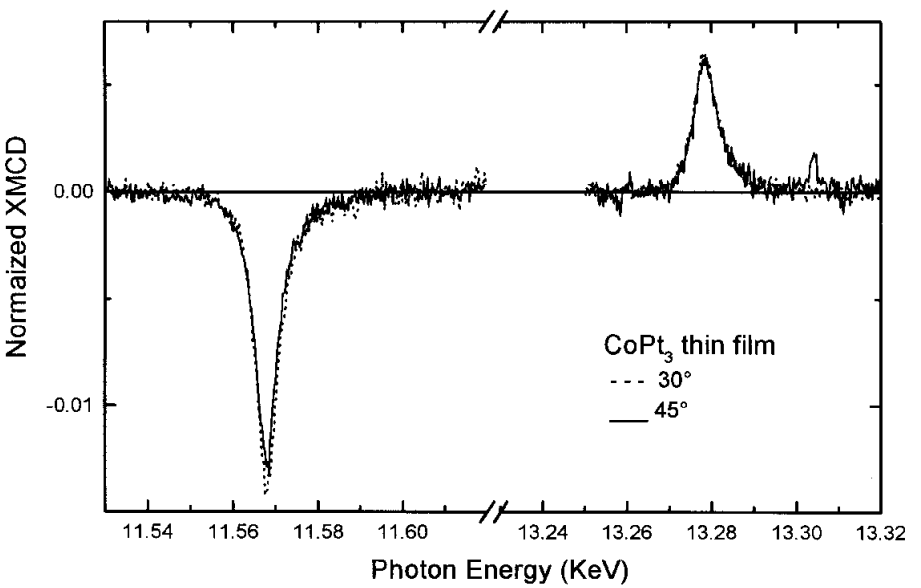
XMCD experiments were carried out at the ESRF beamline ID12A. The source was the third harmonic of the helical ondulator Helios-Il which allowed us to cover the energy range corresponding to the Pt $L_{2,3}$ absorption edges (from 11keV up to 13.5keV). The energy was selected by a double Bragg-reflection onto a Si (111) crystals, the rate of circular polarization after the monochromator was energy-constant and evaluated to be 90%. Experiments were performed at 30K (bulk sample) and 300K (thin film); the magnetic field 4T was strong enough to saturate the magnetic moment.

Table 1 reports the values of the orbital and spin moments, determining by using the sum rules. Our results show that the expectation of $\langle L_z \rangle$ is enhanced in the thin film, which is consistent with the observation of a modulation composition along the growth direction.

In order to probe magnetic anisotropy on an atomic scale, we performed XMCD angle-dependent measurements. The XMCD curves recorded at different angles with respect to the normal of the surface ($\alpha = 30°, 45°, 60°$) show a variation about 15%. *In this system, the anisotropy of the 5d orbital moment is relatively small, but should be undoubtedly probed with an improvement of the signal/noise ratio.*

Table 1

	epitaxial (111) $CoPt_3$ thin film (Pt $L_{2,3}$ edges)		*$CoPt_3$ bulk sample*	
α	M_L (μ_B / atom)	M_S (μ_B / atom)	M_L (μ_B / atom)	M_S (μ_B / atom)
30°	0.044±0.005	0.24±0.02	0.020±0.005	0.18±0.02
45°	0.042±0.005	0.22±0.02		
60°	0.038±0.005	0.25±0.02		



Important note: In the framework of the beam time allocated for the HE-129 proposal (Magnetism of the Pd Heusler alloys and analogs), some experiments should have been devoted to the Pd_2TiAl ternary compounds. At the stoichiometric composition, Pd_2TiAl, which presents the cubic Heusler $L2_1$ structure, has been reported as a ferromagnetic system with a Curie temperature about 900K (K.U. Neumann et al., JMMM, 137, 264, 1994). However, as the three samples we prepared, with the expected cubic structure, do not presented any trace of ferromagnetic phase, we used the beam time to first XMCD experiments at the $L_{2,3}$ absorption edges of Pt in CoPt.

* the susceptibility at 4.2K is lower that 3.10" emu/mole