ESRF	**Experiment title:** Magnetic moments in Pt/Ni multilayers probed by XMCD measurements	**Experiment number:** HE422
Beamline: 12A	**Date of experiment:** from: 25/11/98 to: 04/12/98	**Date of report:** 21/05/99
Shifts: 24	**Local contact(s):** A. Rogalev	*Received at ESRF:* 02 JUIN 1999

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Report:

Magneto-optic (MO) recording demands materials with perpendicular magnetic anisotropy, large response at the blue wavelength, resistance against corrosion and oxidation and Curie temperature (T_C) not much higher than the room temperature. Co/Pt multilayers have been found to fulfil the first three of these criteria [1]. However, the large T_C of the Co layers has prompted a search for alternative solutions. For example, addition of Ni to the Co layers was shown to reduce T_C, while the samples retain good features for storage applications [2]. Recently, Co/Pt multilayers with intercalating Ni layers [3] and Ni/Pt multilayers [4] have been recognised as candidates for MO recording. While the Ni/Pt interface has become a matter of primary importance for applications, the role of Pt at this interface is a matter of conflict. Studies with magnetometry techniques, like SQUID or VSM, have report either slightly enhanced [5] or strongly reduced magnetisations [6] for Ni/Pt multilayers attributing the effect to Pt polarisation [5] or to two dead Ni-layers due to proximity to Pt at the Ni/Pt interface [6]. It is only via the element-specific X-ray Magnetic Circular Dichroism (XMCD), at the BL ID12A and ID12B, that we are now in a position to answer this matter.
Ni/Pt multilayers were measured at the Ni and Pt L_2 and L_3 edges under a field of 2 T at a temperature of 10 K. Pt polarisation was detected in all samples including the series with the thinnest Ni layers (2 ML). The magnetic moments for Ni and Pt were determined in a similar way to the one described in Ref. [7]. Table I provides magnetic moments for a set of samples.
Our results:

(a) show that Pt acquires a relatively large moment 0.17-0.29 μ_B/atom (depending on Ni-thickness, Table I) at the interface comparable to the induced moments reported for Co/Pt based systems [7].

(b) reveal a reduction of the Ni moment (depending on Pt-thickness) at the interface. However, we exclude the existence of magnetic dead Ni layers, contrary to what it is stated in recent literature [6].

$n(ML)$	$m(ML)$	μ_{Ni} (μ_B/atom)	μ_{Pt} (μ_B/atom)
6	2	0.49	0.29
2	2	0.39	0.17
2	5	0.24	0.09
6	5	0.47	0.17
13	5	0.54	0.21

Table I

Magnetic moments μ_{Ni} and μ_{Pt} for Ni_n/Pt_m multilayers (n and m are numbers of monolayers in each multilayer period).

(c) allow to construct a magnetic-moment profile for the full multilayer period [8]. A schematic drawing is shown in Fig. 1. Layer-resolved magnetic moments are important for basic physics (comparison to theoretical calculations) and technology (understand and improve properties for applications). The magnetic-moment profile shows that hybridisation effects are located mainly at the Ni/Pt interface in excellent agreement with the structural observation of sharp interfaces [4].

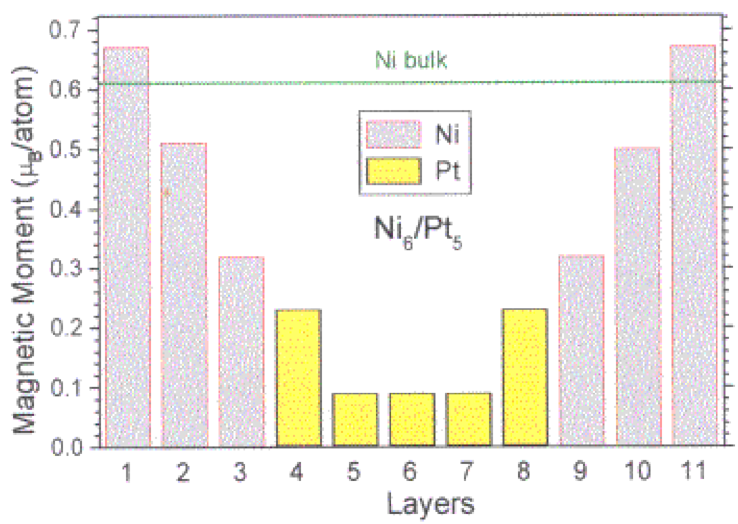

Figure 1

Magnetic-moment profile of a Ni/Pt multilayer for the full multilayer period

Details about (i) the calculations and the construction of the magnetic-moment profile and (ii) the comparison of the XMCD determined moments to theoretical predictions and the magnetisations determined by the non-element specific SQUID magnetometry will be given in a forthcoming publication [9].

References

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