EUROPEAN SYNCHROTRON RADIATION FACILITY

INSTALLATION EUROPEENNE DE RAYONNEMENT SYNCHROTRON

ESRF

Experiment Report Form

The double page inside this form is to be filled in by all users or groups of users who have had access to beam time for measurements at the ESRF.

Once completed, the report should be submitted electronically to the User Office using the **Electronic Report Submission Application:**

http://193.49.43.2:8080/smis/servlet/UserUtils?start

Reports supporting requests for additional beam time

Reports can now be submitted independently of new proposals – it is necessary simply to indicate the number of the report(s) supporting a new proposal on the proposal form.

The Review Committees reserve the right to reject new proposals from groups who have not reported on the use of beam time allocated previously.

Reports on experiments relating to long term projects

Proposers awarded beam time for a long term project are required to submit an interim report at the end of each year, irrespective of the number of shifts of beam time they have used.

Published papers

All users must give proper credit to ESRF staff members and proper mention to ESRF facilities which were essential for the results described in any ensuing publication. Further, they are obliged to send to the Joint ESRF/ ILL library the complete reference and the abstract of all papers appearing in print, and resulting from the use of the ESRF.

Should you wish to make more general comments on the experiment, please note them on the User Evaluation Form, and send both the Report and the Evaluation Form to the User Office.

Deadlines for submission of Experimental Reports

- 1st March for experiments carried out up until June of the previous year;
- 1st September for experiments carried out up until January of the same year.

Instructions for preparing your Report

- fill in a separate form for each project or series of measurements.
- type your report, in English.
- include the reference number of the proposal to which the report refers.
- make sure that the text, tables and figures fit into the space available.
- if your work is published or is in press, you may prefer to paste in the abstract, and add full reference details. If the abstract is in a language other than English, please include an English translation.

ESRF	**Experiment title:** ***Direct evidence for the role of Pt in a new type of multilayers with superior features for perpendicular magneto-optic recording: CoCr/Pt***	**Experiment number**: HE-1777
Beamline: ID12	**Date of experiment**: from: 14/12/04 to: 20/12/04	**Date of report**: 30/08/05
Shifts: 18	**Local contact(s)**: N. Jaouen, F. Wilhelm, A. Rogalev	*Received at ESRF:*

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Report:

CoCrPt alloys and Co/Pt multilayers are excellent candidates for perpendicular magnetic or magneto-optic recording. Very recently we have combined these two systems CoCrPt and Co/Pt in a novel multilayer type: CoCr/Pt. First magneto-optic Kerr (MOKE) spectroscopy measurements have revealed a very large Kerr rotation enhancement at high energies (at about 4 eV) which is larger than the one of CoCrPt alloys, in combination with perpendicular anisotropy. In the HE-1777 experiment, x-ray magnetic circular dichroism measurements

have been performed on such multilayers at a temperature of 10 K. A 1 T field was adequate to bring the samples with perpendicular anisotropy to magnetic saturation, as Figure 1 reveals. XMCD signals were recorded at the $L_{3,2}$ edges of Pt in all samples which were tested. Typically, in Figure 2 we show the XMCD signal recorded at the $L_{3,2}$ edges of Pt for a CoCr(1 nm)/Pt(0.6 nm) multilayer with perpendicular anisotropy. Using the sum rules, the ratio of orbital-to-spin magnetic moment was found to be relatively small, of about 0.14±0.01 only, as compared to the typical value of 0.2 for Co/Pt or Ni/Pt multilayers. The total magnetic moment carried by the 5*d* shell of Pt is 0.17 μ_B/atom. These findings are in good agreement with measurements on bulk CoCrPt and CoCrPtTa samples, which were earlier published [1]. No large Pt orbital moment contribution or large Pt orbital moment anisotropy was revealed. This should be attributed to the presence of Cr, which modifies the electronic structure of both, Co and Pt. Co acquires a small (Ni-like) magnetic moment [2] and Pt spin and orbital moment decrease as compared to Co/Pt multilayers. Then, the perpendicular anisotropy observed in the CoCr/Pt system seems to originate mainly from the decrease of the shape anisotropy. More analysis is in process and the results will be presented in a future publication [3].

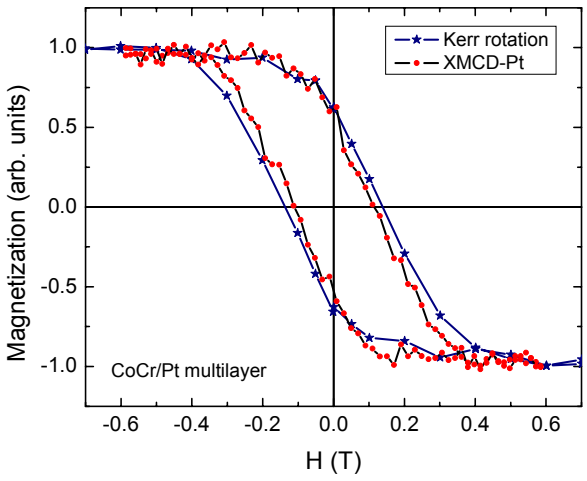

Figure 1: Hysteresis loops at perpendicular field direction recorded by MOKE (stars) and XMCD (circles)

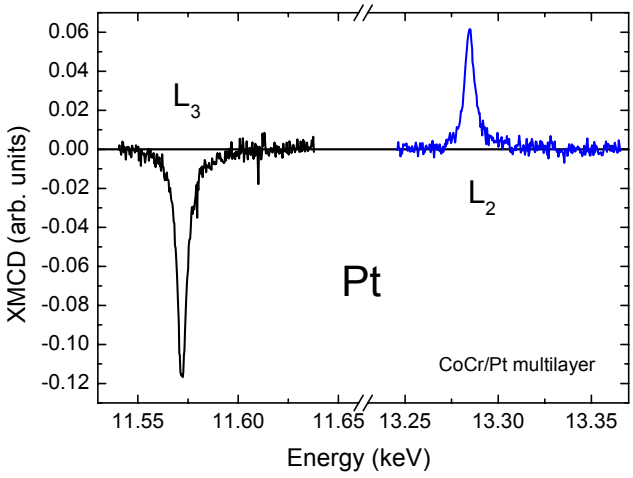

Figure 2: XMCD signals at the $L_{3,2}$ edges of Pt in a CoCr/Pt multilayer.

References

1. P. Poulopoulos et al., Phys. Stat. Sol(a). **201**, 3243 (2004).
2. N. Inaba and M. Futamoto, J. Magn. Magn. Mater. **226-230**, 1014 (2001).
3. P. Poulopoulos et al., (in preparation).