EUROPEAN SYNCHROTRON RADIATION FACILITY

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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:** ***CoCrPtTa perpendicular magnetic recording media: Exploring the role of Pt and Ta induced magnetic moments by the element-specific x-ray magnetic circular dichroism***	**Experiment number**: HE-1463
Beamline: ID12	**Date of experiment**: from: 20/07/03 to: 27/07/03	**Date of report**: 25/02/04
Shifts: 18	**Local contact(s)**: N. Jaouen, F. Wilhelm, A. Rogalev	*Received at ESRF:*

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Report:

CoCrPt-based alloys are among the most interesting materials for perpendicular magnetic recording. However, up to now no experiment was reported to probe induced magnetic moments of the 5*d* constituents in these alloys. Here we present the first such results recorded during the HE-1463 experiment. CoCrPt and CoCrPtTa alloys were prepared by arc melting under Argon atmosphere. X-ray diffraction (XRD) experiments revealed that the samples are polycrystalline hcp. The samples were measured at T = 5 K by using magnetic fields up to 4

Tesla in order to reach complete magnetic saturation. For the first, to our knowledge time, Pt and Ta induced magnetic moments were clearly recorded via the x-ray magnetic circular dichroism (XMCD) technique. In Fig. 1 we present the x-ray absorption (XAS) signal recorded at the Pt L_3 edge. This is compared with Pt XAS recorded in a Ni/Pt multilayer [1]. The clear difference in the shape of the spectra is attributed mainly to the different crystallographic structure and secondly to differences in the electronic structure. Pt is crystallized in a slightly strained fcc lattice in Ni/Pt multilayers. On the contrary, Pt is in a hcp lattice in the CoCr-based alloys. In Fig. 2 (a) one may see the XAS and the XMCD signals at the Pt $L_{3,2}$-edges from CoCrPt. The sum-rule analysis reveals an induced Pt magnetic moment of 0.2 μ_B/atom. Moreover, in Fig. 2 (b) we present the XMCD signal from Ta $L_{3,2}$-edges in CoCrPtTa indicating the presence of ferromagnetism on the sites of the 5*d* element. The magnetic moment of Ta is determined to be very small ~ 0.03 μ_B/atom. The difference in the sign of the spectra indicates that Pt and Ta are oppositely polarized: Pt is parallel and Ta antiparallel to the external field and to Co moment. More details will be published soon [2], while the data will be presented in the second Seeheim Conference on Magnetism in Germany, 27 June – 1 July 2004.

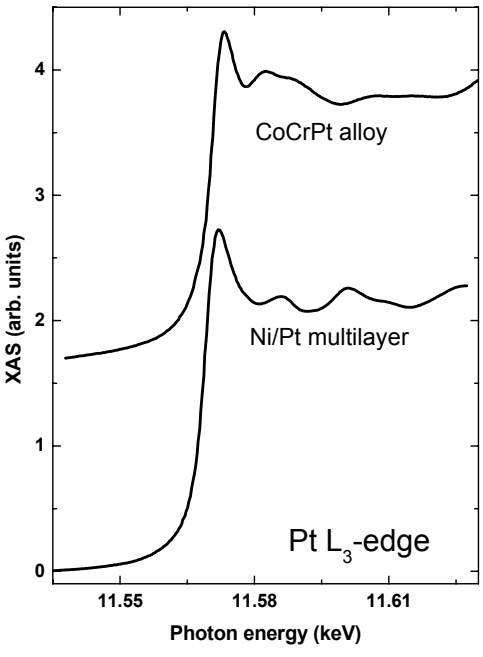

Fig. 1

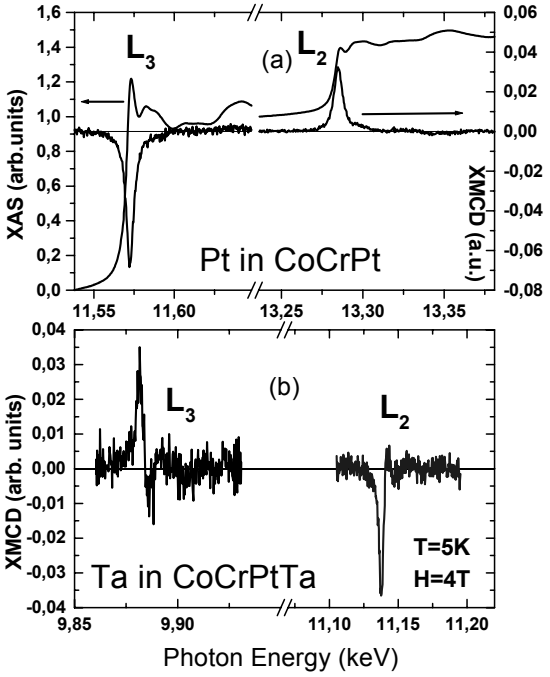

Fig. 2

References

1. P. Poulopoulos et al., J. Appl. Phys. 89, 3874 (2001).
2. P. Poulopoulos et al. Phys. Stat. Sol. (a) (to be submitted).