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:** ***Dependence of the induced 5d magnetic moments on the crystallographic and local chemical environment by x-ray magnetic circular dichroism (XMCD)***	**Experiment number**: HE-1665
Beamline: ID12	**Date of experiment**: from: 28/07/04 to: 04/08/04	**Date of report**: 28/02/05
Shifts: 18	**Local contact(s)**: N. Jaouen, F. Wilhelm, A. Rogalev	*Received at ESRF:*

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Report:

The target of this project was to investigate the dependence of the induced magnetic moments of a 5*d* element, this is W, on the crystallographic and the local chemical environment. In order to fulfill our task we have performed XMCD measurements on a unique combination of materials, giving us the possibility to make precise exchange of atoms and environments like the ones that have been done up to now only in a computer calculation: type (A) $Fe_{97}W_3$ and type (B) $(FeCo)_{97}W_3$ alloys have exactly the same crystallographic body centered cubic (bcc)

structure with the same lattice parameter, the only difference being that in (B) two Fe atoms at ordered positions in the unitary cell are replaced by Co. So, one succeeds in keeping the same bcc crystallographic structure, which is the natural one for W, while changing precisely its chemical environment. We have probed two samples of type (A): a bulk sample and a 50 nm thick film. One step beyond, type (C) $Co_{97}W_3$ alloys bring the W atoms in an exotic hexagonal structure not encountered for bulk W. The XMCD results are compared to data recorded on type (D) Fe/W multilayers, see also [1]. Before taken them to synchrotron, the high quality of all samples was verified via x-ray diffraction experiments. In Fig. 1 we present the XMCD spectra at the L_2-edge of W for three of the above mentioned samples, as indicated. Obviously, the magnitude of the XMCD changes strongly depending on the different environment around W. A more careful view shows also small changes in the relative intensity of spectral features. Since the lattice has been kept the same (bcc), these changes could be attributed to differences in the electronic structure. Figure 1 confirms our predictions. A precise analysis and details will be provided in a forthcoming publication [2].

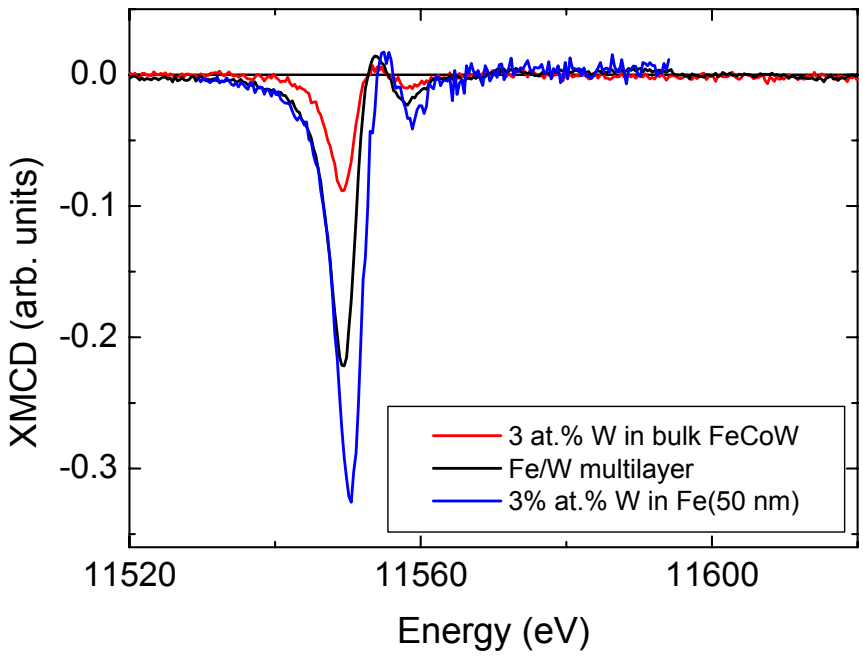

Figure 1: XMCD spectra at the W L_2-edge of representative samples as indicated.

References

1. F. Wilhelm et al., Phys. Rev. Lett. **87**, 207202 (2001).
2. F. Wilhelm et al., Phys. Rev. B (to be submitted).