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 via the User Portal:

https://wwws.esrf.fr/misapps/SMISWebClient/protected/welcome.do

Reports supporting requests for additional beam time

Reports can 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:** Exchange coupled CoO / FePt ultra-thin films grown on Pt(001)	**Experiment number**: 32.03.702
Beamline:	**Date of experiment**: from: 23/2/2011 - 1/3/2011	**Date of report**: 01/09/2011
Shifts:	**Local contact(s)**: De Santis Maurizio	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

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Report:
Temporary report

During this experiment we have elaborated *in situ* at BM32 beamline a layered system by growing ~3 nm of CoO on an ultra-thin (about 1.5 nm thick) PtFe layer on Pt(001). The PtFe layer is chemically ordered with the tetragonal *c* axis perpendicular to the surface and in coherent epitaxy. The average *c/a* ratio is about 0.93, smaller then the bulk value (0.96). The oxide structure corresponds in a first approximation to a CoO(111) film. A deeper structural study reveals a clear monoclinic distortion.

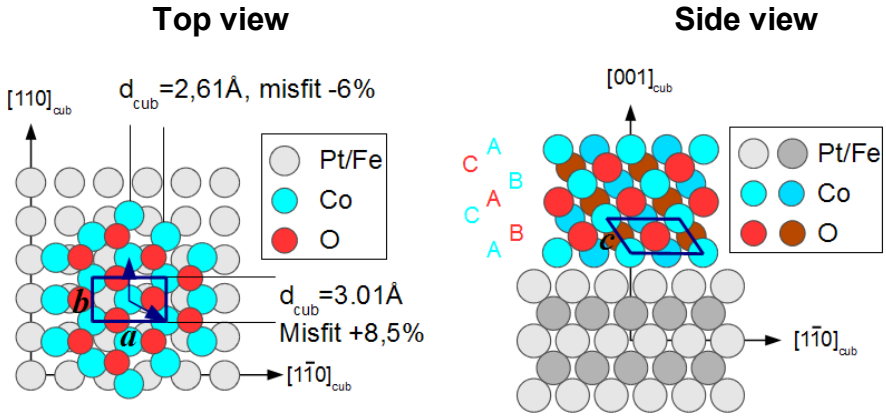

Fig.1: Schematic top view (a) and side view (b) of the match at the interface between CoO(111) and Pt(001).

Figure 1 shows how the CoO(111) and Pt(001) structure could match at the interface. Four of this domains are observed in diffraction owing to the symmetry of the substrate. Due to the anisotropic stress, the induced strain on the AFM film results in a slightly distorted cubic structure, which is then described by a

monoclinic cell (space group *C2/m*) like the bulk CoO low temperature phase. This distortion is clearly evidenced by the comparison between the experimental (-1 0) and the (0 1) rods of the hexagonal surface cell, which are equivalent in the cubic and non-equivalent in the monoclinic structure (Fig. 2). This experimental observation correspond to the fact that the *c* axis for the hexagonal surface cell is no more perpendicular to the surface. Such a distortion observed at room temperature is of the same order of magnitude as the one of the low temperature bulk phase. However, the monoclinic *bc*-plane results compressed instead of expanded. This difference would possibly give rise to a modification on the antiferromagnetic behavior of the layer.

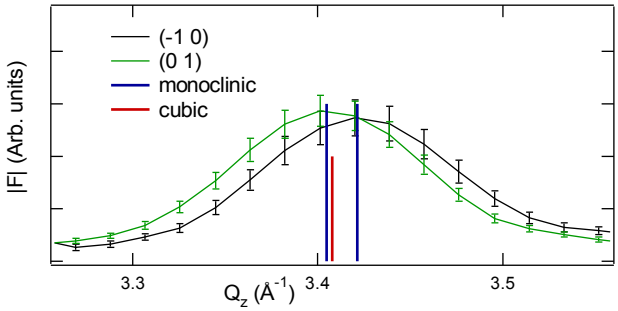

Figure 2. Comparison between the (-1 0) and (0 1) rods of the CoO hexagonal surface mesh CoO measured on the CoO/PtFe/Pt(001) sample.

The system shows perpendicular magnetic anisotropy and exchange bias after field cooling from room temperature.

The results of this experiment have been presented at the ECOSS-28 conference, Wroclaw, 28 August-2 September 2011.