

## Experiment Report Form

<https://www.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.



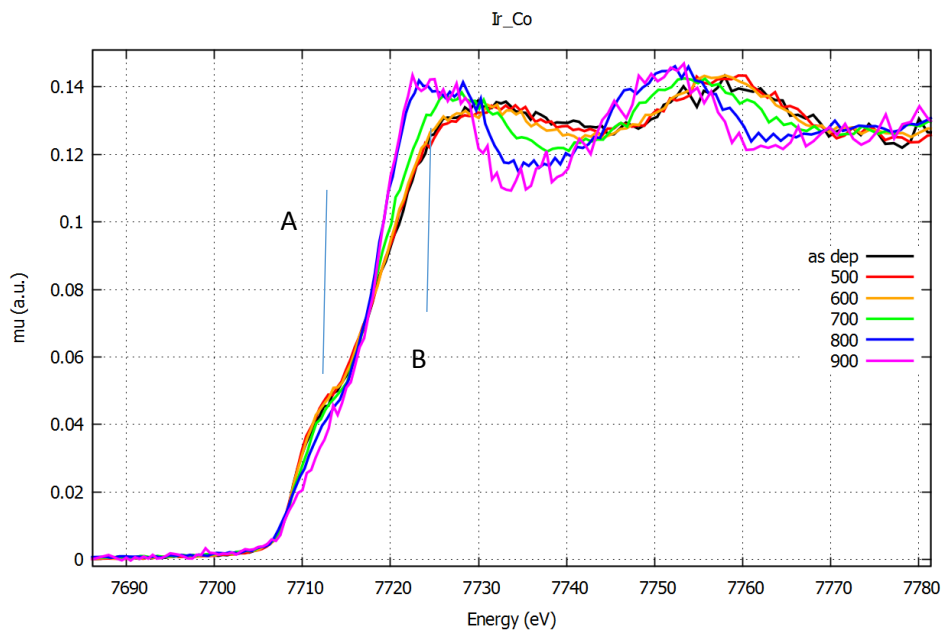
	<b>Experiment title:</b> XAFS study of structural and magnetic effects induced by intercalation on Gr/Co/Ir systems	<b>Experiment number:</b> HC 1853
<b>Beamline:</b> BM 23	<b>Date of experiment:</b> from: 13 <sup>th</sup> of May 2015 to: 18 <sup>th</sup> of May 2015	<b>Date of report:</b> 01/07/2015
<b>Shifts:</b>	<b>Local contact(s):</b> Sakura Pascarelli	<i>Received at ESRF:</i>
<b>Names and affiliations of applicants</b> (* indicates experimentalists): <b>I. Carlomagno, J. Drnec, S. Vlais, C. Meneghini, R. Felici</b>		

### Report:

This experiment studied thin (1-2 nm thick) Co films deposited on Ir(111) substrate with the aim of understanding the fate of Co ions under thermal treatment, up to 900 C. These findings are part of a larger project aimed to understand the role of Graphene (Gr) in determining the structural behavior and the magnetic response of Co film in Gr/Co/Ir(111) films .

Previous XRD experiments [ihsi778, hc896, hc915] demonstrated the thermal treatment induces structural effects at the Co/Ir interface, x-ray absorption spectroscopy has the aim to reveal these changes from a local perspective, looking at the Co atoms.

To carry out the experiment we developed a small UHV chamber which can be coupled to the UHV system of the ID03 laboratory and then transferred to the BM23 while keeping the sample under UHV conditions. In this way a 2nm-thick Co film was deposited on the Ir(111) substrate in UHV conditions ( $P=10^{-10}$  mbar) at the ID03 beamline and characterized by LEED and XPS before its transfer. The sample was then moved to the BM23 where Co K edge XAS measurements were carried out in the near edge region (XANES) treating the sample at progressively high temperatures (500 to 900 °C, 5 min. each) as planned in the proposal. Several scans were measured for each temperature: the sample was rotated by 0.5deg once every 3 scans in order to shift the Bragg peaks along the spectrum allowing one to remove them. For each annealing temperature, once the Bragg peaks were removed, the experimental spectra were averaged up. The results are compared in the figure below.



**Figure:** Co K edge Experimental spectra measured on Co/Ir(111) 2 nm thick film as a function of annealing temperature.

Preliminary ab initio simulations carried out using FEFF 8 program demonstrate that these changes are consistent with the formation of a disordered Co-Ir alloy with approximately 50% Co and Ir.

Unfortunately we could not carry out all the measurements foreseen in the proposal because the 13-elements Ge detector broke down few days before the experiment and we have been forced to work with a single Si detector. This resulted in an acquisition time almost 10 times longer than planned and we could not complete our experiment. In particular, we were unable to measure the Gr/Co/Ir(111) film.

However these preliminary results gave important information about the Co-Ir intermixing process. Moreover, this experiment has also pointed out the feasibility of the measurements and gave hints to improve the set up.

We feel confident that the modifications already planned for the experimental setup and the use of the 13 elements Ge multidetector will ensure reasonable collection time to accomplish the proposed experiment either by rescheduling of the present proposal because of the technical failure of the detector or by resubmitting a new proposal at the next deadline (September 2015).