



## 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://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> In-situ X-ray diffraction study of Fe-Si alloys in an internally-heated diamond anvil cell	<b>Experiment number:</b> ES-491
<b>Beamline:</b> ID27	<b>Date of experiment:</b> from: 19 November 2016      to: 22 November 2016	<b>Date of report:</b> 30 August 2017
<b>Shifts:</b> 9	<b>Local contact(s):</b> MEZOUAR Mohamed	<i>Received at ESRF:</i>
<b>Names and affiliations of applicants</b> (* indicates experimentalists): *Tetsuya Komabayashi (main proposer), *Giacomo Pesce, School of GeoSciences, University of Edinburgh *Daniele Antonangeli, IMPMC, Université Pierre et Marie Curie *Guillaume Morard, IMPMC, Université Pierre et Marie Curie		

## Report:

Within the allocated beamtime, we conducted high-pressure (P) and –temperature (T) in-situ X-ray diffraction (XRD) experiments on Fe-Si-(Ni) alloys in an internally-heated diamond anvil cell (DAC) at ID27. The principal research goal is to place constraints on the P-T location of the boundary between the face-centred cubic (FCC) structure and hexagonal close-packed (HCP) structure in Fe-4wt%Si (hereafter Fe-4Si). We already had several data in our previous beamtime (ES-268).

In-situ XRD experiments were performed at ID27 with a monochromatic wavelength of 0.3738Å. The sample temperature was measured by the spectroradiometric system available on the beamline and the pressure was obtained from the unit-cell volume of the HCP phase and its thermal equation of state. We prepared 4 cells for Fe-4Si in advance at different pressures. During compression one cell broke diamond anvils.

First we increased the pressure at room temperature. At a constant load, the temperature was then increased by directly applying a DC current across the metallic sample (thermally insulated from the diamonds). The first cell was compressed to 24 GPa and then heated up. At 1233 K we observed appearance of FCC peaks and confirmed disappearance of all the peaks of the HCP phase at 1327 K. Experiments on the second cell at 41 GPa also confirmed coexistence of the FCC and HCP phases at 1744 and 1940 K. In the third cell which were from 123 GPa at 300 K to 157 GPa at 4400 K, we only observed HCP phase.

All the experimental data obtained in this beamtime are consistent with our own existing data in the previous beamtime, and we feel that we have obtained enough data to publish a paper.