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

Deadlines for submission of Experimental Reports

Experimental reports must be submitted within the period of 3 months after the end of the experiment.

Experiment Report supporting a new proposal ("relevant report")

If you are submitting a proposal for a new project, or to continue a project for which you have previously been allocated beam time, you must submit a report on each of your previous measurement(s):

- even on those carried out close to the proposal submission deadline (it can be a *"preliminary report"),*
- even for experiments whose scientific area is different form the scientific area of the new proposal,
- carried out on CRG beamlines.

You must then register the report(s) as "relevant report(s)" in the new application form for beam time.

Deadlines for submitting a report supporting a new proposal

- 1st March Proposal Round - **5th March**
- 10th September Proposal Round - **13th September**

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.

Instructions for preparing your Report

- fill in a separate form for each project or series of measurements.
- type your report in English.
- include the experiment number 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:** Investigation of possible chemical reaction between iron and periclase and iron and bridgmanite at deep mantle conditions	**Experiment number**: ES-874
Beamline: ID15B	**Date of experiment**: from: 17/10/2018 to: 23/10/2018	**Date of report**: 26/02/2021
Shifts: 18	**Local contact(s)**: Michael Hanfland, Federico Cova	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

Georgios Aprilis*: Materials Physics and Technology at Extreme Conditions, Laboratory of Crystallography, Universität Bayreuth, D-95440 Bayreuth, Germany
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Report:

The aim of the experiment was to investigate the existence of chemical reaction(s) between iron and periclase (MgO) and iron and bridgmanite ($MgSiO_3$) at conditions of high pressure and temperature using single crystal X-ray diffraction and Mossbauer spectroscopy inside the laser heated diamond anvil cell. Periclase and bridgmanite are the major constituents of the lower mantle and the proof of a reaction (or the lack of it) with iron is crucial in the determination of the compositional and structural conditions of the earth's deeper mantle as well as the mantle-core boundary.

Beam time in two beamlines was requested in the proposal, ID18 and ID15B. No beamtime was granted for ID18 and 18 shifts were allocated for ID15B. Since ID15B is not equipped with an online laser heating system for diamond anvil cells, and the *in situ* pulsed laser heating was necessary for the project, the experiments of the proposal were not carried out.

However, the allocated beamtime at ID15B gave the opportunity to carry out experiments on different projects including the collection of X-ray diffraction data on samples that were laser heated offline. The collected data were incorporated in the results of the applicants' publications in the next years[1,2].

References:

[1] Bykov, M., Chariton, S., Fei, H. *et al.* High-pressure synthesis of ultraincompressible hard rhenium nitride pernitride $Re_2(N_2)(N)_2$ stable at ambient conditions. *Nat Commun* **10,** 2994 (2019).
[2] Aprilis, G., Pakhomova, A., Chariton, S. *et al.*The effect of pulsed laser heating on the stability of ferropericlase at high pressures. *Minerals* **10**, 542 (2020).