EUROPEAN SYNCHROTRON RADIATION FACILITY

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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: Determination of post-spinel and post-perovskite transformations kinetics in Mg_2SiO_4**	**Experiment number**: HS-3832
Beamline:	**Date of experiment**: from: 24/07/09 to: 29/07/09	**Date of report**: 03/10/09
Shifts:	**Local contact(s)**: Mohamed Mezouar	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

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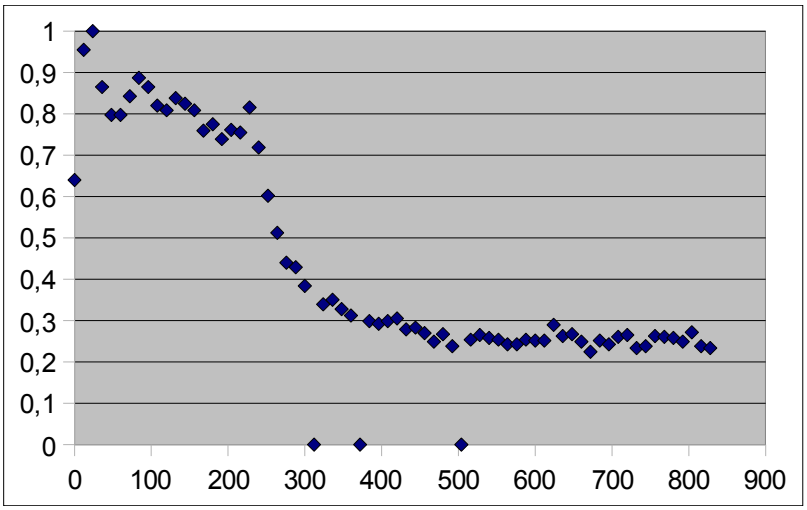
Report:

In this report we show the first results obtained on the $MgSiO_3$ post-perovskite transformation kinetics during the beamtime allocated at the end of July 09 (experiment HS-3832).

For this experiment, we used 100-300 diamond anvil cells. The starting sample consisted of pure Mg_2SiO_4 mixed with a small amount of Pt used as a laser absorber. The MgO produced by the post-spinel transformation was used as an internal pressure scale. NaCl was used as a pressure medium and thermal insulator.

After reaching the target pressure (105 GPa), we heated the sample in order to produce the perovskite phase $MgSiO_3$ and MgO. During the process the sample was annealed, removing the crystal defects and relaxing the stresses caused by the cold compression. Then the pressure was increased to the post-perovskite domain so that the kinetics measurements could start. We could measure the transformation kinetics at 2100 K, 2300 K and 2600 K, within a pressure range of 110-120 GPa. Exposures were recorded every 12 seconds and the temperature carefully monitored during that time.

It is quite difficult to follow the post-perovskite phase growth because of the lack of statistics when only a few grains are present on the diffraction images. We thus decided to first track the perovskite phase diffraction peaks intensities with time, representing the disappearance of that phase and the related growth of the post-perovskite phase. This is what is shown in the example below:



Evolution of $MgSiO_3$ perovskite diffraction peaks intensity with time at 115 GPa and 2100 K

Even if additional work is needed (e.g. Rietveld fitting), these are very encouraging results which prove that kinetics measurement can be done in laser heated diamond anvil cells. This dataset will ultimately be fitted with an Avrami equation, and will be used to discuss the nucleation and growth processes needed to derive valuable deep Earth structure and dynamics models.