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 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:** High-pressure elasticity of FeO	**Experiment number**: HS-3197
Beamline: ID-28	**Date of experiment**: from: 22.11.2006 to: 04.12.2006 (22.12 - 26.12 – set-up time)	**Date of report**: 27.02.2007
Shifts: 18	**Local contact(s)**: Michael Krisch	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

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ESRF

Report:

We carried out high-pressure measurements of acoustic phonon dispertion in $Fe_{0.94}O$ up to about 20 GPa by mean of inelastic X-ray scattering (IXS) from the single-crystal.

The instrument was operated using the Si (9 9 9) configuration, with an incident photon energy of 17.794 keV and a total instrumental energy resolution of 3 meV full-width-half-maximum (FWHM). The dimensions of the focused x-ray beam were 25 x 60 mm^2 (horizontal x vertical, FWHM), and the momentum resolution was set to 0.3 nm^{-1}.

The crystal was first loaded in neon as a pressure transmitting medium but the quality of the collected spectra was not saticfactory. Another loading in helium was performed with success. The single crystal oriented perpendicular to the [110] axe was placed in the sample chamber along with several ruby chips. Pressure measurements have been performed using a ruby fluorescence scale. In IXS experiment we measured the longitudinal acoustic (LA) phonon branches along the [001] and [110] directions (Fig. 1), the transverse acoustic (TA) branch along the [111] direction, and the quasitransverse branch along the [100] direction. The individual elastic modulii were calculated using the Christoffel equations for sound velocities calculated for the centre of the Brillouin zone.

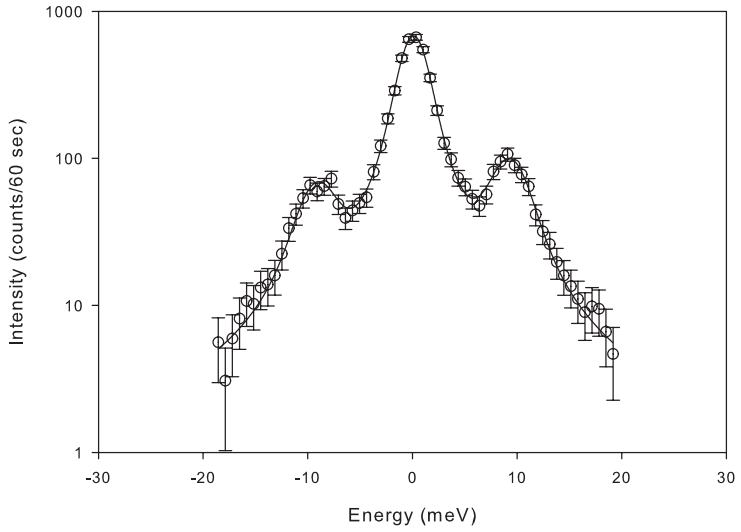

Fig. 1. Representative IXS spectrum of $Fe_{0.94}O$ single crystal collected at 9.2 GPa. LA [110] phonon for Q(2.1;2.1;0).

In parallel to the IXS spectra, the Bragg angles of the (002) and (220) reflections were recorded, in order to provide an independent determination of density for each pressure point.

As a result full elastic tensor of $Fe_{0.94}O$ was determined up to a rhombohedral phase transition (at about 18 GPa). A strong softerning of C_{44} elastic constant up to a phase transition and a greate advance after a structure distorsion was recorded. Independent equation of state was determined by mean of X-ray diffraction data.