EUROPEAN SYNCHROTRON RADIATION FACILITY

INSTALLATION EUROPEENNE DE RAYONNEMENT SYNCHROTRON

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

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.

ESRF	**Experiment title:** **Size effect on local structure of barium titanate doped with Ce as a function of temperature and composition**	**Experiment number**: Ma2497
Beamline: Id22	**Date of experiment**: from: 26/6/2015 to: 29/06/2015	**Date of report**: 1/03/2016
Shifts: 9	**Local contact(s)**: Giacobbe	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

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Report:

A detailed structural study has been performed on nanocrystalline BaCexTi1-xO3 ceramic solid solution with x = 0.05, 0.10, 0.20 and 0.30, between 100 and 400 K, with the aim of understanding the average and local structure variations as a function of composition and temperature, taking into account the effect of grain size as well. The same solid solution was already proposed in microcrystalline form (MA2315, at ID22). For this investigation we have selected the compositions BaTi1-xCexO3 with x = 0.05, 0.10, 0.20 and 0.30. The large difference in size between Ti4+(0.605 Å) and Ce4+ (0.87 Å) will maximize the possibility to detect variations in the local structure as well as a different evolution of the local structure with composition, to be compared with the system BaTi1-xZrxO3. The four compositions correspond to a different polar behaviour: conventional ferroelectric (x = 0.05), diffuse phase transition (x = 0.10), non-ergodic relaxor (x = 0.20) and ergodic relaxor (x = 0.30). The measurements was performed on nanoceramics prepared from nanopowders obtained by an hydrothermal-like method. The average dimensions of the grains were about 100-110 nm. The data were collected with the 2D detector with Xrays at 80 keV, with the minimum possible distance sample-detector (which was about 50 cm), which allowed a Qmax of about 30 Å. The data are of good quality and the procedures for integration were correctly explained by the local contact.
We had a few problems with some of the images (mainly regarding the mask used during integration) but these were promtply solved.

The data analysis is still in progress, but a preliminary checked showed that the cell parameters of the studied nanopowders are in very good agreement with those of the corresponding micro-crystalline ceramics (collected during experiment MA2315). The phase transitions with temperature, being very subtle, were not observed due to the nano-grains of the samples.