

# 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 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.



**Experiment title: Local Structure of Ge and Pb in Ge,Pb/O glasses: occurrence of correlations with stable and metastable phases**

**Experiment number:**  
08-01-208

<b>Beamline:</b> BM08	<b>Date of experiment:</b> from: 20/02/2000 to: 22/02/2000	<b>Date of report:</b> 27/10/2000
<b>Shifts:</b> 6	<b>Local contact(s):</b> Pier Lorenzo Solari	<i>Received at ESRF:</i>

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## Report:

EXAFS spectra of selected  $(1-x)\text{PbO}/x\text{GeO}_2$  samples (see Table 1) were collected at room temperature on both Ge-K and Pb-L<sub>III</sub> edges.

Figure 1 summarises all spectra collected on the Ge K-edge. For all the samples, the local chemical environment of Ge was found quite close to that of hexagonal and glassy  $\text{GeO}_2$ . The most interesting feature is the clear presence in all the spectra of a next nearest neighbour shell which is attributed to Ge atoms belonging to the tetrahedral  $\text{GeO}_4$  chains.

In all examined glasses, the Pb environment is very similar (see Figure 2). Crystalline  $\text{PbGe}_3\text{O}_7$  spectrum is somewhat different and can be reasonably fitted by introducing at least 3 Pb-O distances. This last aspect can be nicely related to the slow formation rate of the latter compound on devitrification.

Table 1

Sample	$x$	$D_{(\text{Pb-O})}(\text{\AA})$	$\sigma_{(\text{Pb-O})}$	$D_{(\text{Ge-O})}(\text{\AA})$	$\sigma_{(\text{Ge-O})}$	$D_{(\text{Ge-Ge})}(\text{\AA})$	$\sigma_{(\text{Ge-Ge})}$
Glass 5	0.50	2.31	$7.0 \times 10^{-3}$	1.77	$1.2 \times 10^{-2}$	3.23	$7.0 \times 10^{-3}$
Glass 9	0.65	2.27	$1.8 \times 10^{-2}$	1.76	$1.18 \times 10^{-2}$	3.21	$3.6 \times 10^{-3}$
Glass 6	0.75	2.28	$1.6 \times 10^{-2}$	1.76	$1.8 \times 10^{-2}$	3.16	$1.1 \times 10^{-3}$
Glass 7	0.80	2.30	$1.4 \times 10^{-2}$	1.76	$6.7 \times 10^{-3}$	3.22	-
Glass 8	0.90	2.27	$1.9 \times 10^{-2}$	1.75	$1.9 \times 10^{-2}$	3.19	$4.1 \times 10^{-3}$
Cryst. $\text{PbGeO}_3$	0.50	2.28	$1.6 \times 10^{-2}$	1.76	$3.0 \times 10^{-3}$	3.18	-
Cryst. $\text{PbGe}_3\text{O}_7$	0.75	2.36		1.76	$2.8 \times 10^{-3}$	3.25	$3.3 \times 10^{-3}$
Glass $\text{GeO}_2$				1.75	$1.2 \times 10^{-3}$	3.20	$4 \times 10^{-3}$
Tetr. $\text{GeO}_2$	1.00			1.85 1.89	$5.8 \times 10^{-3}$ $1.0 \times 10^{-3}$	$\approx 3.4$	
Hex. $\text{GeO}_2$	1.00			1.73	$1.8 \times 10^{-2}$	3.17	

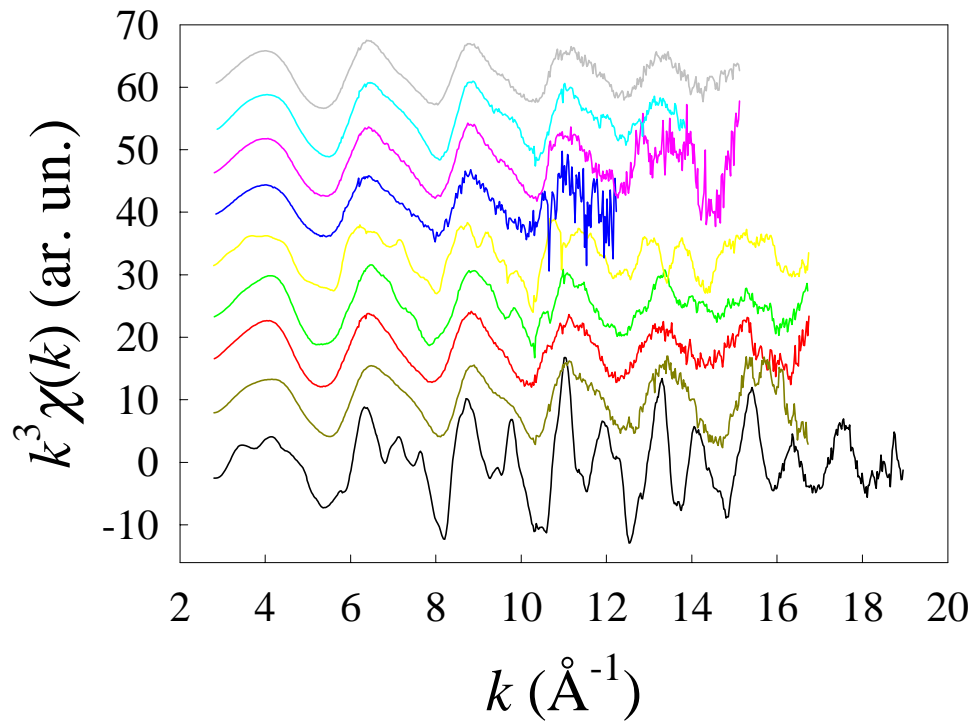


Fig. 1-EXAFS spectra at the Ge-K edge of selected samples in the Ge,Pb/O system; black line: hexagonal  $\text{GeO}_2$ ; brown line: glassy  $\text{GeO}_2$ ; red line: glass 5; green line: crystalline  $\text{PbGeO}_3$ ; yellow line: crystalline  $\text{PbGe}_3\text{O}_7$ ; blue line: glass 6; magenta line: glass 7; cyan line: glass 8; gray line: glass 9.

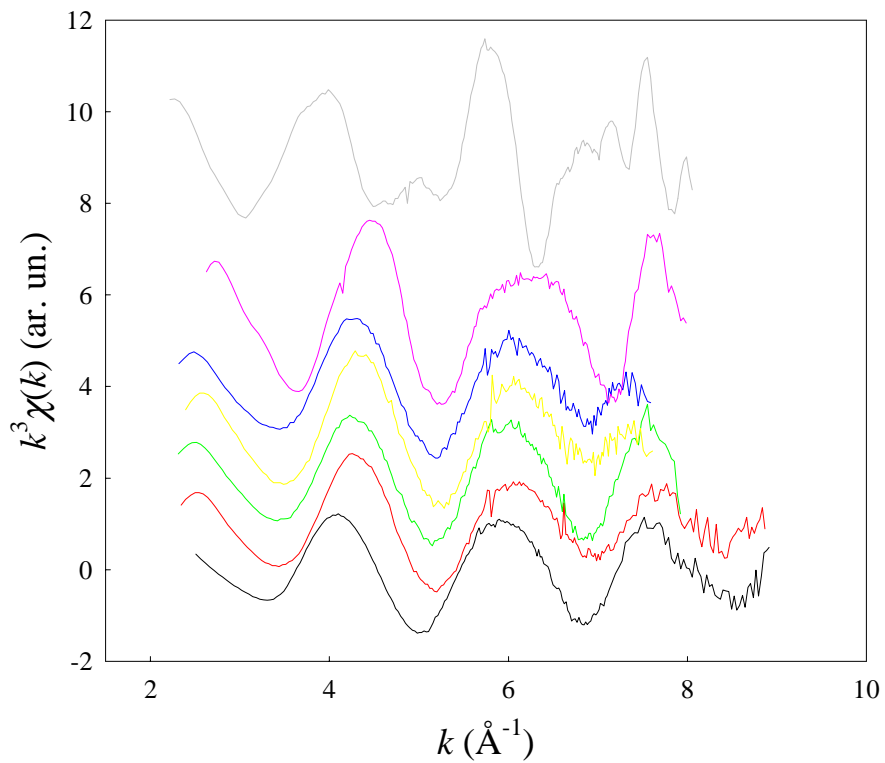


Fig. 2-EXAFS spectra at the Pb-L<sub>III</sub> edge of selected samples in the Ge,Pb/O system; black line: glass 5; red line: glass 6; green line: glass 7; yellow line: glass 8; blue line: glass 9; magenta line: crystalline  $\text{PbGeO}_3$ ; gray line: crystalline  $\text{PbGe}_3\text{O}_7$ .