ESRF	**Experiment title:** INVESTIGATION OF THE HIGH-TEMPERATURE BEHAVIOR OF TRANSITION ELEMENTS IN NATURAL MELTS	**Experiment number**: ME-154
Beamline: ID 26	**Date of experiment**: from: 20/06/01 to: 25/06/01	**Date of report**: 25/02/02
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Report: In order to understand the structural silicate-melts properties, particularly localized around transition elements, we performed some *in situ* measurements under extreme conditions, at high-temperature and high-pressure (HT-HP). We used a new experimental procedure by associating the Paris-Edinburg press (ID 30) with ID 26 beamline. HT-HP measurements were done up to 1200 °C and 5 GPa respectively. We collected series of quick-XANES spectra at different edges, in anhydrous samples. The first sample studied was an anhydrous albite-like glass ($NaGaGe_3O_8$), in which aluminum was substituted to gallium, and silicon was substituted to germanium. Both, Ga and Ge K-edges (10367 and 11103 eV respectively) XANES were collected at 2.16 GPa and up to 900 °C. Figure 1 presents the XANES spectra collected at the Ge K-edge. In this fully polymerized glass sample, Ge is 4-coordinted at the ambient conditions. The results show that there is no structural modification around Ge in the albite-like glass due to the pressure effect between 1 bar and 2.16 GPa at ambient temperature. Moreover, no changes in the XANES spectra can be observed when the

temperature increases up to 900 °C. Consequently, the structural environment of Ge is not modified under these HT-HP conditions. However, the melt-state was not obtained because of the too low signal-to-noise ratio on XANES spectra at these extreme conditions.

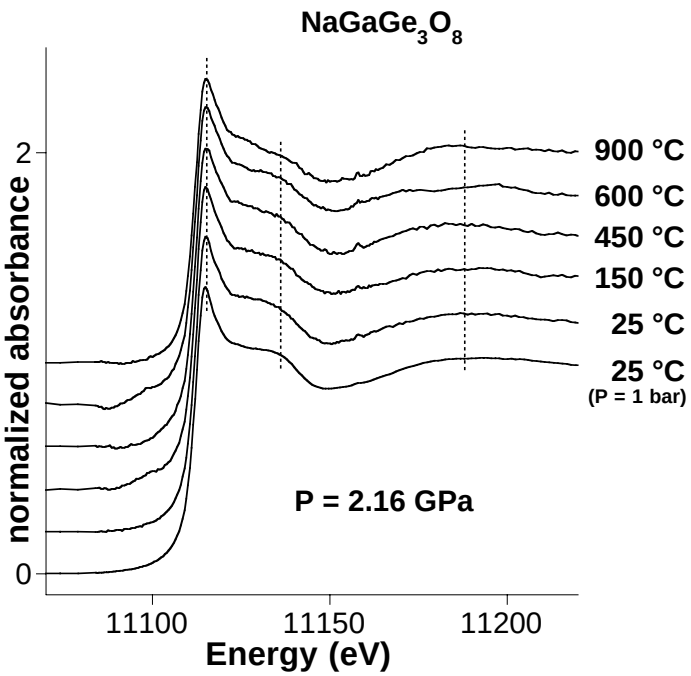

Fig. 1 - XANES spectra collected at the Ge K-edge, up to 2.16 GPa and 900 °C, in $NaGaGe_3O_8$ glass sample.

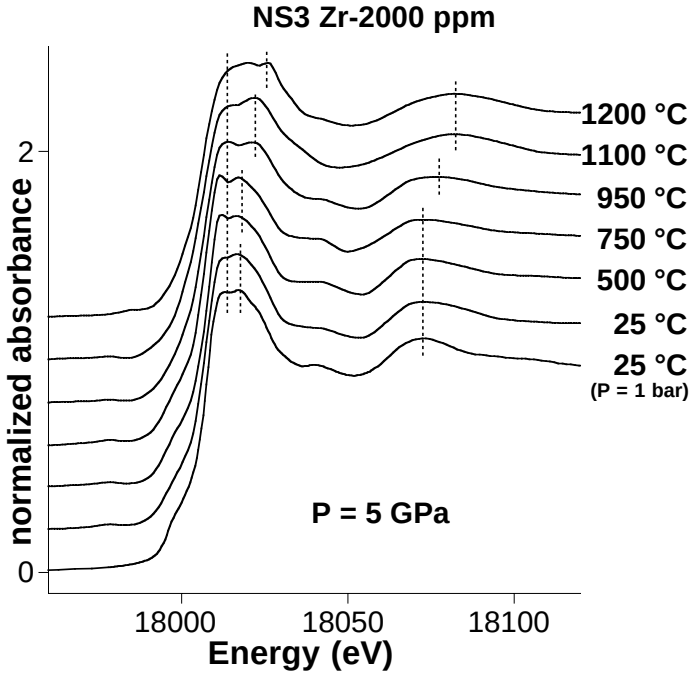

Fig. 2 - XANES spectra collected at the Zr K-edge, up to 5 GPa and 1200 °C, in NS3 Zr-2000 ppm glass sample.

Finally, we collected some series of quick-XANES spectra for an ultra-diluted sample, NS3 glass ($Na_2Si_3O_7$) containing 2000 ppm of zirconium, in which Zr is 6-coordinated. Zirconium K-edge XANES spectra, collected at 5 GPa and up to 1200 °C, are presented in Figure 2. No significant changes due to the pressure (5 GPa) can be observed at ambient temperature. However, at 5 GPa and around the glass transition temperature (≈ 950 °C), some changes appear in the XANES. Those changes are more easily identified in the melt-state (around 1200 °C). Particularly, one can observe the white-line that is divided in two features, and a significant shift toward the high energies for the first EXAFS oscillation. Such changes in the XANES spectra typically traduce some modifications of the short-range environment, suggesting Zr in a lower coordination number in the *in situ* state, which is in excellent agreement with our previews studies on nickel in silicate melts (Farges et al., 2001).