

was installed in the beamline. In addition, one series of high-pressure experiments at Ge K-edge at room temperature was performed. For this experiment a small ruby crystal was placed near the gasket rim and served as a pressure indicator. The ruby was probed by a green laser and the shift of the ruby fluorescence line served as a pressure indicator.

The temperature in the RH-DAC was monitored using thermocouples, which were precisely attached to the back side of the diamonds leaving central part of the diamond surface free for the penetration of the X-rays through the sample.

We collected data at isothermal condition at 515 °C by varying pressure (from 3 to 23 GPa), as well as at isobar conditions at about 3 GPa by varying the temperature (from 25 to 550 °C). The data on compression at room temperature were acquired up to ~ 95 GPa.

The representative XANES spectra on Ge K-edge collected at 515 °C and varying the pressure between 3 and 23 GPa are plotted in Figure 1. As the pressure increases the network formers Ge and Si undergo a transformation from tetrahedral to octahedral geometry. This structural change is manifested in the Ge XANES spectra. We observe a shift of the first XANES peak to higher energies and a relative intensity decrease of the shoulder after the first XANES peak. It seems that this trend is not finished at 23 GPa, which indicates that at 515 °C the conversion to octahedral coordination is not completed.

Figure 2 shows first EXAFS fit results on the first shell bond distance evolution as a function of pressure on the sample measured at room temperature.

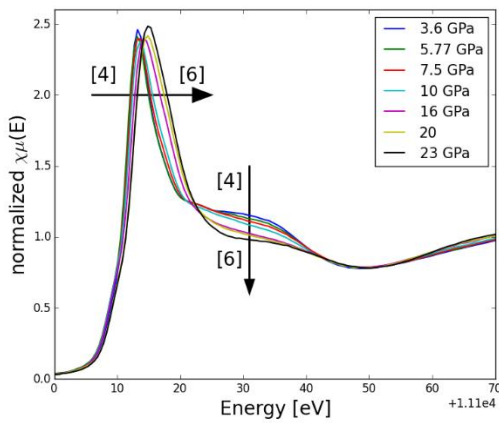


Figure 1. Normalized Ge K-edge XANES spectra collected at 515 °C at pressure between 3 and 23 GPa on amorphous $\text{Na}_{0.45}\text{Ca}_{0.1}\text{Mg}_{0.05}\text{Sr}_{0.5}\text{Si}_{1.95}\text{Ge}_{0.5}\text{O}_{7.8}$

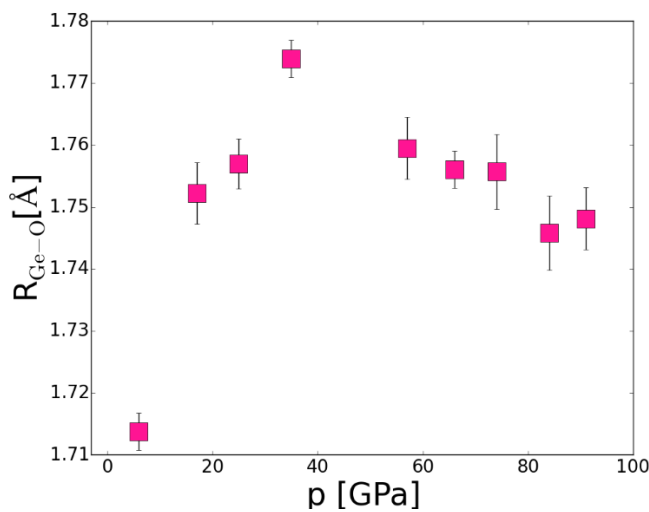


Figure 2. First fit results on Ge K-edge of the glass as a Function of increasing pressure at room temperature. First shell Ge-O bond distance $R_{\text{Ge-O}}$ reaches maximum at 35 GPa.

These first fit results show that maximum Ge-O bond length is reached at ~ 35 GPa, which indicates full conversion to octahedral coordination. Beyond this pressure the bond distance shows a decreasing trend up to

92 GPa. Compared to GeO₂ glass in our complex alumino-silicate-germanate glass the completion of the conversion to octahedral coordination is at slightly higher pressure [4, 5, 6]. Whereas compared to SiO₂ glass, it is completed at lower pressure [7]. As seen above, at 515 °C and 23 GPa the octahedral coordination seems not to be reached. An interesting question is whether a temperature of 515 °C significantly influences the compression of silicate-germanate glasses compared to the room temperature. For the glassy state i.e. at temperatures below the glass transition, there is the general question whether the conversion to octahedral coordination may be shifted to lower pressure due to thermal enhancement of the structural relaxation during compression. For these and similar questions further experimental investigations are needed.

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