Structural Study of Germante Glass under Pressure

O. Ohtaka [1]*, M Yoshida [1], Y. Ohnishi[1], H. Arima[2], K. Funakoshi[2], D. Wakabayashi[3] and N. Funamori[3]

[1] *Earth and Space Science, Osaka University, Toyonaka, Osaka 560-0043, Japan*
[2] *CROSS, Tokai, Ibaraki, 319-1106, Japan*
[3] *Photon Factory, KEK, Tsukuba 305-0801, Japan*

Keywords: alkali germanate glass, coordination change, high pressure, multi-anvil press, in-situ X-ray studies, XAFS, XRD

*e-mail: ohtaka@ess.sci.osaka-u.ac.jp

Using a large volume multi-anil high-pressure apparatus, Rb2O-4GeO2 glasses have been compressed up to 13 GPa at room temperature and their local structural changes have been investigated by in-situ XAFS and XRD methods. In the XAFS experiment, X-ray absorption spectra near Ge K-edge and Rb K-edge were measured. The change of the coordination number from 4 to 6 begins above 6 GPa and does not complete within the present experimental pressure range. On decompression, reversal transition occurs. Almost no sixfold coordination of Ge is preserved after the complete release of pressure.

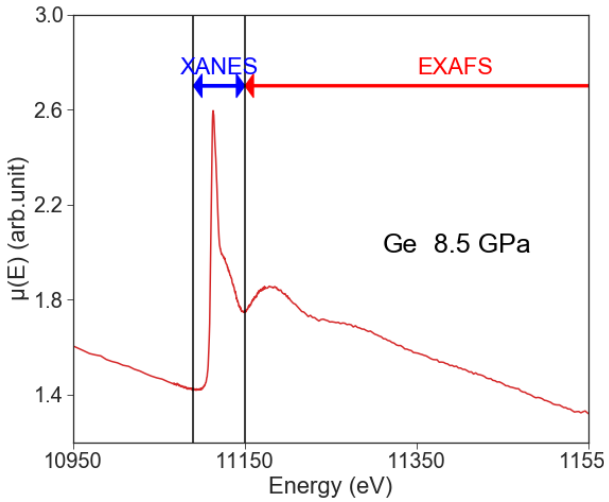

Figure 2. XANES and EXAFS spectra around Ge absorption edge at 8.5 GPa and room temperature.

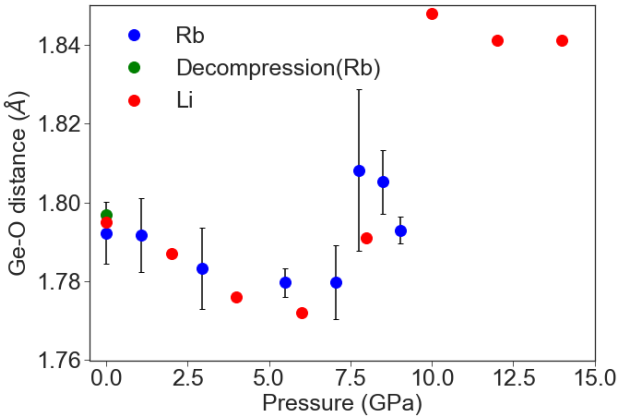

Figure 2. Variation of Ge-O distances with pressure obtained by EXAFS analysis. Rb is the present Rb_2O-4GeO_2 glass and Li is our previous study of Li_2O-4GeO_2 glass [(1)].

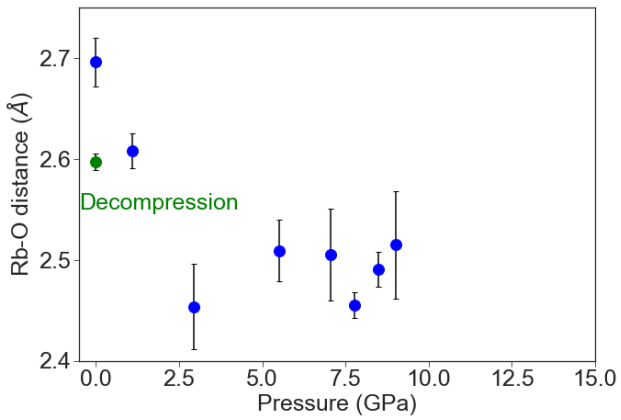

Figure 3. Variation of Rb-O distances in Rb_2O-4GeO_2 glass with pressure obtained by EXAFS analysis.

1) Ohtaka et al., Phys. Rev. Lett. 92, 155506 (2004).