Basaltic glass structure by time-of-flight neutron diffraction

T. SAKAMAKI[1], T. HATTORI[2], A. SANO-FURUKAWA[3]

[1]Tohoku University, sakamaki@m.tohoku.ac.jp
[2]JAEA, hattori.takanori@jaea.go.jo
[3]JAEA, sanoasa@post.j-parc.jp

Structural changes in basaltic magmas with pressure play a central role in controlling magma mobility and melting. Pressure-dependent structural changes in the melt structure are associated with transformations in the coordination of aluminum ions (Al^{3+}). However, the pressure-induced change in Al^{3+} coordination is still unclear because the bond distance between aluminum and oxygen (Al-O) is close to silicon-oxygen length (Si-O). That is, structure factor, *S(Q)*, with a wide *Q* range is needed for a peak separation.

The structure of basaltic glass has been measured up to 8 GPa using a time-of-flight neutron diffraction at PLANET beamline in Japan Photon Accelerator Research Complex (J-PARC). The staring material is synthesized basaltic glass, and it was compressed by Paris-Edinburgh press. The significant oscillation was found up to at least 23 $Å^{-1}$. This means that the resolution in the pair distribution function is Δr=0.27 Å.

With increasing pressure, the basaltic glass displays large shift in the first sharp diffraction peak (FSDP) in *S(Q)* to higher-*Q*, indicating rapid shrinkage in the intermediate-range ordered structure. Corresponding behavior is also found in the pair distribution function. We will show a detailed discussion about the pressure dependence of short- and intermediate-range ordered structure of basaltic glass.