

## Longitudinal wave velocity of sodium aluminosilicate melt at high pressure

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The longitudinal wave velocity ( $V_P$ ) of sodium aluminosilicate (Na-Al-Silicate: NAS) melt was measured up to 3.7 GPa and 1542 K using the ultrasonic technique combining with synchrotron X-ray diffraction and radiography at BL04B1 of SPring-8. The velocity of NAS melt decreased with pressure up to 3.7 GPa although the NAS glass showed the positive pressure dependence of the velocity.

The  $V_P$  pressure dependence of NAS melt is completely different from that of diopside melt, which showed monotonous increase with pressure. The difference in  $V_P$  pressure dependence results from the degree of the polymerization of the silicate network. NAS melt is polymerized one and the ratio of non-bridging oxygen (NBO) to tetrahedrally cation (T) is 0.5. On the other hand, the NBO/T of diopside melt is 2, which means the melt has depolymerized network. In the case of polymerized melt, the first stage of the pressure-induced structural change is the drastic shrinkage of the void of network because the cavity of polymerized network is much larger than that of depolymerized melt. Therefore, the compressibility of the NAS melt is very high at low pressure, and the  $V_P$  decreases with pressure.

Assuming that the natural composition (e.g., basalt), the NBO/T of the magma generated at the uppermost mantle is about 0.7, which indicates polymerized melt. In this case, the pressure dependence of the velocity may be negative and the high-pressure velocity is smaller than ambient velocity. Thus, the presence of the polymerized melt in the mineral aggregation causes the efficient decrease in the velocity of bulk rock. The velocity anomaly at the shallower region of the Earth's interior, such as the top of asthenosphere, can be caused by an existence of tiny amount of partial melt.