

Sound velocity of Al-bearing hydrous and anhydrous bridgmanites under high pressure

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Bridgmanite is a major constituent mineral in the lower mantle, and it is important to clarify the sound velocity to elucidate the mineral assembly (composition) of the lower mantle. Recently we reported that Al-bearing bridgmanite (Mg-silicate perovskite) can contain significant amount of water up to ~0.8 wt%, and confirmed the possible H position in the bridgmanite by means of the powder neutron diffraction analysis in J-PARC, together with the single crystal X-ray structural analysis in PF. Because of the H in the bridgmanite, the physical properties of the bridgmanite should be changed. So the determination of the effect of water for the sound velocity of bridgmanite is very important to discuss the possible water storage in the lower mantle.

For the comparison, the sound velocity measurement of anhydrous bridgmanite is also important. However, even in the anhydrous bridgmanite, the substitution forms are complicated. We recognize that both “Tschermak substitution” and “oxygen-vacancy substitution” forms exist in anhydrous bridgmanite. So the special attention was made to synthesize the two different anhydrous bridgmanites by preparing the appropriate compositional starting materials and conducting experiments in extremely anhydrous condition.

We succeeded to synthesize the polycrystalline hydrous and anhydrous bridgmanites using the Kawai-type high pressure apparatus (Orange 3000) in Ehime University suitable for the sound velocity measurements. In situ ultrasonic experiments combined with X-ray were conducted in BL04B1 beamline, SPring-8. In this talk, we will explain the experimental results in details.

Keywords: hydrous bridgmanite, anhydrous bridgmanite, lower mantle, Synchrotron X-ray in situ experiment, sound velocity