## Possible compositional region of Al-bearing anhydrous bridgmanite

## \*Toru Inoue<sup>1,2</sup>, Masamichi Noda<sup>2</sup>, Sho Kakizawa<sup>2</sup>

1. Department of Earth and Planetary Systems Science, Graduate School of Science, Hiroshima University, 2. Geodynamics Research Center, Ehime University

Bridgmanite should be a major constituent mineral in the Earth's lower mantle, and Irifune (1994) reported that bridgmanite can incorporate almost  $Al_2O_3$  component in lower mantle. The Al substitution mechanism is supposed to be complicated, because there are two types of Al substitution mechanisms in anhydrous bridgmanite, Tschermak and oxygen vacancy substitutions (e.g. Kojitani et al., 2007). However, the pure Tschermak and oxygen vacancy substitutions bridgmanite has not been reported so far in low Al content, when we checked the previous studies carefully (e.g. Irifune et al, 1996; Kubo and Akaogi, 2000). The previous studies have used powder samples as the starting materials, so we considered that the absorbed water may affect the results, because we have a knowledge of the possible existence of hydrous bridgmanite which has a water content of ~0.8 wt%. Therefore, we tried to investigate the possible existence of the Al substitution mechanism in bridgmanite as a function of Al content in extremely anhydrous condition.

The high pressure experiments were conducted at 28 GPa and 1600-1700°C for 1 hour using a Kawai type apparatus. Some different Al content samples were prepared as the starting materials along the ideal substitution line of Tschermak and oxygen vacancy substitutions, respectively. Glass rods were used as the starting materials to eliminate the absorbed water on the sample surface. Moreover, the glass rods were enclosed in a rhenium capsule to prevent the water incorporation from the surrounding cell assembly. In addition, all parts of the cell assembly were dried just before the synthesis experiments. The chemical compositions of the starting materials were examined by SEM-EDS, and the recovered samples were identified by X-ray and neutron (in J-PARC) diffractions and SEM-EDS.

Our results show that it is possible to exist both Tschermak and oxygen vacancy substitution bridgmanites in low Al content in anhydrous condition. The maximum Al content for pure oxygen vacancy substitution bridgmanite was ~0.025 pfu in total cation of 2, and the existence of oxygen vacancy substitution component was restricted to be less than Al=~0.1 pfu. The present result combining with our previous study in hydrous condition, shows that hydration in Al-bearing bridgmanite should occur easily if hydrogen exists in the system (lower mantle) in pyrolite (MgO-excess) composition. Thus the large deviation from the Tschermak substitution in the previous studies mainly should come from the hydration from the absorbed water.

Keywords: lower mantle, bridgmanite, Al2O3 component, anhydrous condition, hydrous condition