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Science Research Bldg. 1, 4th floor.
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Phase relation in a natural hydrous basalt under the lower mantle conditions

It has long been believed that the basaltic crust doesn't play any important roles in water transportation into the deep mantle (Litasov and Ohtani, 2005). Recently, the formation of some new hydrous phases, i.e., Fe-Ti oxyhydroxide, Al-rich phase D, and Al-rich phase H (Al-PhH, hereafter), was reported in hydrous basaltic compositions under the relatively low temperature and at pressures up to 26GPa (Liu et al., 2019), which shed light on the possibility of water transportation into the deeper mantle. In this study, to reconsider the possibility of water transportation by basaltic compositions, High P-T experiments were conducted under the subducted cold slab conditions using natural hydrous basalt. From the recovered samples, the presence of $MgSiO_3$ bridgmanite, Al-rich stishovite, $CaSiO_3$ perovskite, Calcium-ferrite phase, NAL phase, K-rich hollandite, and Al-PhH was confirmed in the hydrous basalt composition. Al-PhH was observed at 27GPa and 1200℃, at 30GPa and 1200-1400℃, at 40GPa and 1400℃. Based on the obtained compositional data sets and mineral proportions evaluated mass-balance calculations, it is shown that the hydrous basalt can retain 1.5-3.0wt% water as Al-PhH under the conditions which close to cold slabs subducted into uppermost lower mantle. At 40 GPa, the water content decreases to 0.8 wt% as the Al-PhH mineral fraction decreases. This indicates that the hydrous mineral may exist in cold subducting slabs under the lower mantle conditions, and when water is retained by hydrous minerals at low pressures, Al- PhH transports some amount of water into even deeper mantle.

Keywords: 1. Hydrous basalt
2. Lower mantle
3. Al-rich phaseH

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