The 420th Geodynamics Seminar

Discovery of a new Al-bearing hydrous phase (23 Å phase) and some implications to the deep earth

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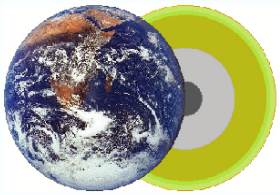

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Abstract

Water plays an important role in modifying the chemical and physical properties of the mantle's rocks and minerals. Water is transferred, released and recycled into the deep mantle through the subduction processes, mainly in the form of hydrous phases. Lots of researches have clarified the stability of hydrous phases in the MgO-SiO_2-H_2O system, which is the most important system for a pyrolitic mantle. Base on the previous results, hydrous phases, such as antigorite or serpentine, dense hydrous magnesium silicates (DHMS) phase A, 10 Å phase, phase E, superhydrous phase B, phase D, were suggested to be stable in the cold subducting slabs.

Here we reported a new aluminum bearing hydrous phase named **23** Å phase after its characteristic *c* axis. **23** Å phase was synthesized at 10 GPa and 1000 ºC The chemical composition of this new **23** Å phase is $Mg_{11}Al_2Si_4O_{16}(OH)_{12}$, and it contains about 12.1 wt% water. Powder X-ray diffraction and electron diffraction patterns show that this new **23** Å phase has a hexagonal structure, with a = 5.1972(2) Å, c = 22.991(4) Å, and V = 537.8(2) Å^3, and the possible space group is *P-6c2, P6$_3$cm, or P6$_3$/mcm*. The calculated density is 2.761 g/cm^3 accordingly, which was determined by assuming that the formula unit per cell (Z) is 1. This crystal structure is quite unique among mantle minerals in having an extraordinarily long *c* axis. Several experiments revealed that its stability region is very similar to that of phase A, up to 12 GPa and ~1200 °C. We further confirm that this new **23** Å phase is stable in the chlorite composition up to 10 GPa and 1000 ºC. The present results indicate that this new **23** Å hydrous could be thermally stable in the subduction zones, and may play an important role in transporting water into deep earth, even into the mantle transition zone.

詳細は当センターホームページ：http://www.grc.ehime-u.ac.jp/ をご覧ください
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