The 400th Geodynamics Seminar

Recent progress for stability and water solubility of hydrous and nominally anhydrous minerals in the mantle

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Abstract

Recently hydrous ringwoodite was found in natural diamond inclusion[1], which water content was ~1.4-1.5 wt%. This shows that the mantle transition zone is really hydrous condition, at least in some regions. In addition, new dense hydrous magnesium silicate, phase H was newly found by first-principle calculation and experimental studies[2]. Thus the study on the water in the mantle becomes a hot topic again after the finding of hydrous wadsleyite and hydrous ringwoodite[3].

Our group has been conducting the study for the stability and water solubility of hydrous and nominally anhydrous minerals, and the recent target is the effect of Al. In this process, we found the new Al-bearing hydrous phase in the upper mantle condition. In addition, we found that Al-bearing bridgmanite (Mg-silicate perovskite) can contain significant amount of water. So we are doing the bridgmanite project to clarify the maximum water solubility in P-T conditions, structure by single crystal X-ray and power neutron diffractions, equation of state and elastic wave velocity. In this talk, I will introduce the recent progress of the water in the mantle and our projects.

References
1. Pearson, D.G.et al., *Nature* **507**, 221-224 (2014)
2. Tsuchiya, J. *Geophys. Res. Lett.* **40**, 4570-4573 (2013); Nishi, M. et al., *Nature Geosci.* **7**, 224-227 (2014)
3. Inoue, T. et al., *Geophys. Res. Lett.* **22**, 117-120 (1995); Kohlstedt et al., *Contrib. Mineral. Petrol.* **123**, 345-357 (1996); Inoue et al., *Earth Planet. Sci. Lett.* **160**, 107-113 (1998)