The 405th Geodynamics Seminar

Water solubility in Al-bearing bridgemanite

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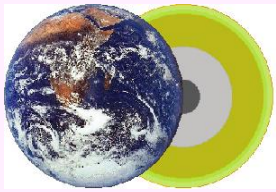

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Abstract

Water is the most abundant volatile element in the Earth. The presence of water affects some physical properties (e.g. melting temperature, bulk modulus, and so on.). Experimental studies on water solubility in the mantle minerals suggest that the upper mantle is dry and the transition zone should be an important water reservoir, because wadsleyite and ringwoodite can contain ~2-3 wt% water in the structure. Actually hydrous ringwoodite (~1 wt% water) was discovered as the diamond inclusion recently. On the other hand, water solubility in the bridgmanite (Mg-silicate perovskite) is a matter of debate.

Water solubility of bridgmanite may increase with increasing Al_2O_3 content. Water solubility of Mg-end member bridgmanite is very low (< 1 ppm H_2O: Bolfan-Casanova et al., 2000) or 60-70 ppm H_2O (Meade et al., 1994). On the other hand, Al-bearing bridgmanite shows 1000-1500 ppm H_2O (4-7 wt% Al_2O_3, Litasov et al., 2003) and 2000 ppm (Murakami et al., 2002). However, Bolfan-Casanova et al. (2003) reported a trace amount of water in spite of 2-6 wt% Al_2O_3.

Recently, our group was synthesized hydrous Al-bearing bridgmanite containing ~8000 ppm H_2O by mainly coupling substitution: $Si^{4+} \rightleftarrows Al^{3+} + H^{+}$. In this seminar, we will discuss about the pressure and temperature dependence of water solubility and property of hydrous Al-bearing bridgmanite using chemical composition and lattice constant data.

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