# Geodynamics Seminar

## 第328回ジオダイナミクスセミナー

# Phase relations and melt compositions in hydrous pyrolite system


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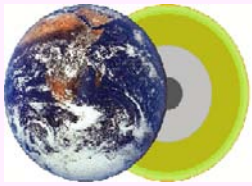
主催：愛媛大学地球深部ダイナミクス研究センター
日時：5/11（金）午後 4時30分～
場所：総合研究棟 4F 会議室



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**Abstract**

Many studies suggest that there could be significant amount of water in the deep Earth, especially in the mantle transition zone (Inoue et al., 1995; Kohlstedt et al., 1996). Water plays an important role in understanding the geodynamics process in the mantle, such as the melting behavior (Inoue, 1994; Kawamoto and Holloway, 1997), phase transformation (Ohtani and Litasov, 2006), and so on. To clarify the effect of water for the mantle peridotite, a series experiments were carried out in pressure range from 12 to 20 GPa and temperatures from 1400° C to 1600° C in pyrolite+water system, by using a Kawai-type multianvil apparatus (ORANGE 1000) with 3mm TEL second stage WC anvils in Ehime University. Some different compositions (Mg/ (Mg+Fe)) of olivine were used for pressure calibration under high temperature, and 2cpx-geothermometer was used to estimate the temperature gradient in the run charge. The starting samples were the mixtures of “pyrolite - MgO” glass, MgO and Mg (OH) 2, thus the water contents were adjusted by the Mg(OH)2/MgO ratio. The samples were sealed by AuPd capsule to prevent the loss of water. The recovered samples were polished, and then the phases were identified by micro-Raman spectroscopy, the textures were observed by BEI, and the chemical compositions were measured by SEM-EDS system. Under hydrous condition, the phase boundary of α/β moved to lower pressure, while the appearance of γ moved to higher pressure, and both phase boundaries became much sharper, compared with dry condition. Garnet was the liquidus phase in the whole P-T range. Compositions of partial melts formed by low degree of melting (<20%) at 12-20 GPa had high CaO/Al2O3 ratio (8-15), and magnesium-rich with (Mg+Fe)/Si ratio larger than 2, which is beyond komatiite composition and much different from that from dry system. Water content of garnet, perovskite, and ringwoodite, phase D were measured by SIMS, and the results showed that, garnet contain about 0.78wt% water, perovskite 0.28wt%, ringwoodite 1.84wt%, while phase D 12.59wt. High water content of garnet may caused by the high majoritic component. The water contents of hydrous melt were determined by mass balance calculations. It shows that the water content of melt is more than 10wt% at 410km depth, even along the hot geotherm, which is much larger than the critical value reported by Matsukage et al. (2005) and Sakamaki et al. (2006). That means the hydrous melt may not be stable atop the 410km depth, and should migrate upwards into the mantle. Thus the low velocity zone atop the 410 km depth reported by Revenaugh and Sipkin (1994) may not come from the melting of the mantle minerals.


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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