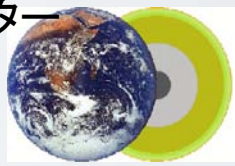
Geodynamics Seminar

第300回ジオダイナミクスセミナー

Thermal equation of state of $MgSiO_3$ akimotoite up to 20 GPa and 1500 K

Speaker :Zhou chunyin
(Ph.D. Student, Ehime University)

主催：愛媛大学地球深部ダイナミクス研究センター
日時：7/8（金）午後 4時30分～
場所：総合研究棟4F　共通会議室



EHIME UNIVERSITY GRC GEODYNAMICS RESEARCH CENTER

Abstract

Akimotoite, the ilmenite form of $MgSiO_3$ magnesium silicate, is stable at pressures between ~18 and 25 GPa and at relative low temperatures in the $MgSiO_3$ system. Previous studies have demonstrated that the presences of iron and aluminum as well as high temperature conditions would significantly reduced the stability field of akimotoite in the systems of $MgSiO_3$-$FeSiO_3$ and $MgSiO_3$-$Mg_3Al_2Si_3O_{12}$ (enstatite-pyrope). Due to its narrow stability field range and depending on the temperature and composition (Fe^{2+}, Al), akimotoite may be present in certain conditions in the mantle but absent in others. Experiments have shown that akimotoite could be a potential important phase in a harzburgite in the cold subducted slabs in the mantle transition zone and may contribute to some geophysical properties at those depths.

Experimental measurements on the thermo-elastic properties of akimotoite at high pressures and high temperatures in the mantle are so far limited except for recent theoretical simulations. Very recently we synthesized polycrystalline sample of $MgSiO_3$ akimotoite using ORANGE-3000 multianvil press in GRC ultrahigh-pressure lab. And we conducted *in situ* X-ray diffraction experiments on the *P-V-T* equation of state (EoS) of akimotoite up to 20 GPa and 1500 K at beamline BL04B1 in SPring-8. We are trying to synthesize $MgSiO_3$ akimotoite polycrystalline of small grain size, well-sintered, and free of cracks, which would be used for future ultrasonic measurements.

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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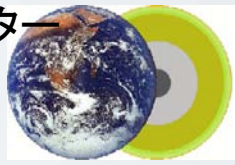
Geodynamics Seminar

第300回ジオダイナミクスセミナー

Phase relations and melt compositions in hydrous pyrolite system

Speaker :Yang Cuiping
(Ph.D. Student, Ehime University)

主催：愛媛大学地球深部ダイナミクス研究センター
日時：7/8（金）午後 4時30分～
場所：総合研究棟4F　共通会議室



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Abstract

Many studies suggested that there are significant amount of water in the deep Earth, especially in the mantle transition zone. Water plays an important role in understanding the geodynamics process in the mantle, such as the melting behavior , phase transformation, and so on. Recently, Litasov and Ohtani (2002) had conducted experiments on relatively simple pyrolite system (CMAS-pyrolite-2wt%) to determine the phase relations and melt composition; and Kawamoto (2004) studied the complex system (H_2O saturated KLB-1 Peridotite), however, the capsule he used absorbed large amount of iron from the starting material. In the present study, we used pyrolite composition with 2wt% and 8wt% water content, to determine the effect of different water content on the phase relations and melt composition. A series experiments were carried out in pressure range from 12 to 18 GPa and temperatures from 1400°C to 1600°C. A kawai-type multianvil (ORANGE 1000) with 3 mm TEL second stage WC anvils in Ehime University was used. San Carlos olivine was used for high temperature pressure calibration. The results showed that transformation of olivine to wadsleyite was found shifting to lower pressure compared with dry condition, while transformation of wadsleyite to ringwoodite to higher pressure, and the boundary was much sharper than the dry condition, which is consistent with the result of Inoue et al. (2010). The stability field of clinoenstatite is lower than 16 GPa at 1400°C, while stishovite appeared under higher pressure condition. Some dense hydrous minerals, such as phase D and superhydrous phase B, existed in the lower temperature part of the cell, due to the temperature gradient in the cell assembly. In the present P-T range, majorite was the liquidus phase, and the melting temperature in 8 wt% H_2O system was much lower than that in the 2 wt% H_2O system. Composition of partial melts formed by low degree of melting had a high CaO/Al_2O_3 ratio, while this value decreased with increasing of degree of partial melting. Now, we are conducting further experiments to clarify the phase relations and melt compositions in a wide P-T range.

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