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PVT data collection for EoS analyses of antigorite and phase A under high pressure and high temperature

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Introduction

Serpentine is an important hydrous phase in the hydrous peridotite layer of the descending slab, and one of the high pressure polymorph of serpentine, antigorite, should be the most important hydrous phase to discuss the transportation of water into the Earth's interior. In addition, antigorite dehydrates to form forsterite (Fo) - enstatite (En) - H_2O below ~6 GPa at around ~600℃, while above ~ 6 GPa, phase A is formed as a dehydration product of antigorite. Thus phase A is a hydrous phase in the upper mantle condition, and should be an important hydrous phases to further transport water into the Earth's deep mantle [1]. The density is an important physical parameter, but the equations of state (EoS) of antigorite and phase A have not been adequately clarified yet under high pressure and high temperature conditions.

We are trying to determine the EoS of antigorite and phase A precisely to clarify the density of hydrous subducted slab under high pressure temperature. In 2011, we could have only one term beam time, because we could not conduct experiment in the period of more than first half of the year.

Experimental

Natural antigorite was used as a starting material, and phase A was synthesized in advance by the mixture of MgO, $Mg(OH)_2$ and SiO_2 in the adequate proportion using the multi-anvil apparatus in Ehime University. We tried to use h-BN and NaCl sleeves to release the deviatric stress. Temperature was measured by W-Re thermocouple, and pressure was calculated by equation of state of NaCl proposed by [2]. Experiments were conducted up to ~10 GPa in the truncated edge length of 4 mm on WC anvil. The diffraction data of sample and pressure standard were collected alternatively for 150 seconds each at intervals of 100℃ with decreasing temperature to release the deviatric stress.

Results and discussion

The data collected P-T conditions of antigorite and phase A were shown in Fig. 1 and Fig.2, respectively. The derived P-V-T data show slightly strange but interesting phenomena, so we are trying to continue further analysis. In the next annual report, we will report the further detailed result of EoS of antigorite and phase A.

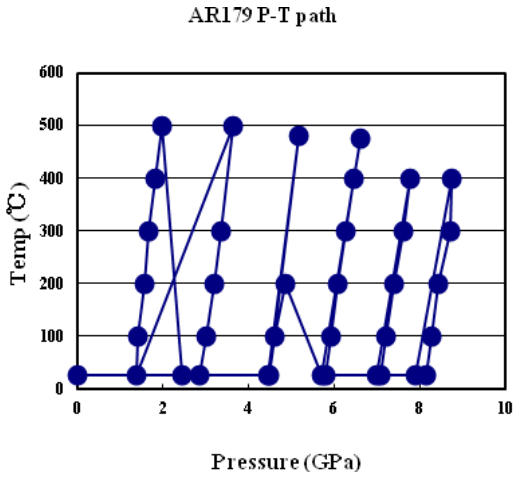

Fig.1 The data collected P-T condition of antigorite using NaCl sleeve.

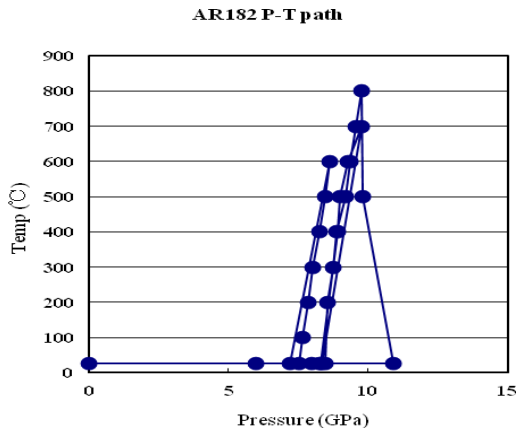

Fig.2 The data collected P-T condition of phase A using NaCl sleeve.

References

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