実験報告書様式(一般利用課題・成果公開利用)

(※本報告書は英語で記述してください。ただし、産業利用課題として採択されている方は日本語で記述していただいても結構です。)

CROSS TOKAI **Experimental Report** J-PARC	承認日 Date of Approval 2014/6/3 承認者 Approver Takanori Hattori 提出日 Date of Report 2014/4/11
課題番号 Project No. 2013B0118 実験課題名 Title of experiment Distortion of $CaSiO_3$ perovskite at lower mantle conditions 実験責任者名 Name of principal investigator Asami Sano 所属 Affiliation Japan Atomic Energy Agency	装置責任者 Name of Instrument scientist Takanori Hattori 装置名 Name of Instrument/(BL No.) BL11 実施日 Date of Experiment 2014. Apr. 02 – 2014. Apr. 7

試料、実験方法、利用の結果得られた主なデータ、考察、結論等を、記述して下さい。(適宜、図表添付のこと)

Please report your samples, experimental method and results, discussion and conclusions. Please add figures and tables for better explanation.

1. 試料 Name of sample(s) and chemical formula, or compositions including physical form.

For pressure calibration run (A0100): NaCl

For main experiments (A0101, A0102): $CaSiO_3$ (Wollastonite)

Dimensitions: 2 mm in diameter, 2 mm in height

2. 実験方法及び結果 (実験がうまくいかなかった場合、その理由を記述してください。)

Experimental method and results. If you failed to conduct experiment as planned, please describe reasons.

The aim of this study is to investigate the tetragonal distortion of $CaSiO_3$ perovskite by in-situ neutron diffraction at high pressure and high temperature. To reach the stability field of perovskite above the pressure of 14 GPa, we tested newly developed 6-8 type high-pressure cells. The cell consists of eight of second stage anivls and furnace assembly. Sintered diamond cubes with truncated edge length (TEL) of 5 mm were used as second stage anvils. The furnace assembly is shown in Fig. 1. The 6-8 type cell was compressed using 6-axis multi anvil press “ATSUHIME” in BL11.

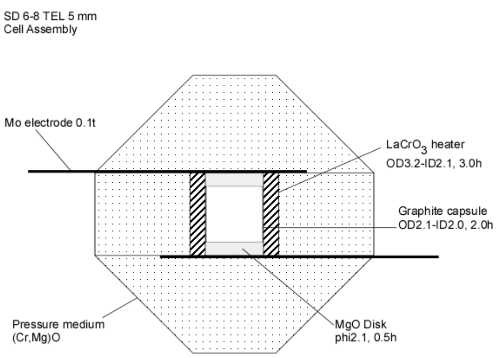

Fig. 1 Furnace assembly.

2. 実験方法及び結果（つづき） Experimental method and results (continued)

Three experiments were conducted; Run A0100, 0101, and 0102.

Run A0100

To check the pressure generation curve, NaCl was compressed to 1600 kN. The pressure was determined to be 16 GPa at 1600 kN using the equation of state of NaCl (Fig. 2). Heating test was also conducted up to 1000 °C. The pressure decreased slightly during the heating test; 14 GPa at 800 °C.

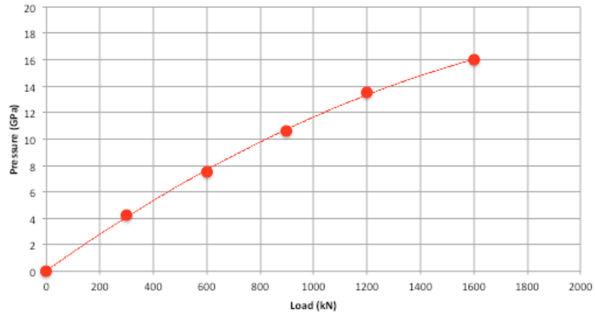

Fig. 2 Pressure calibration curve for 6-8 type cell with TEL of 5 mm (A0100).

Run A0102

Based on the result of the run A0100, the sample of $CaSiO_3$ was compressed to 1900 kN to reach the stability field of perovskite. The pressure at 1900 kN was determined to be 20 GPa using the equation of state of MgO. Heating was failed due to the short-circuit of the heating system, caused by insufficient insulation of blow out cover. After the experiment, adequate insulation was putted on the cover.

Run A0102

The sample of $CaSiO_3$ was heated at 1900 kN. After keeping at 1100 °C for 3 hours, the synthesis of calcium perovskite was confirmed from diffraction pattern. The diffraction pattern of calcium perovskite was taken for 36 hours after the temperature was decreased to ambient condition. (Fig. 3). Temperature was increased again to 1100 °C to confirm the tetragonal-cubic transition that is previously reported. The refinement of the crystal structure is now in progress.

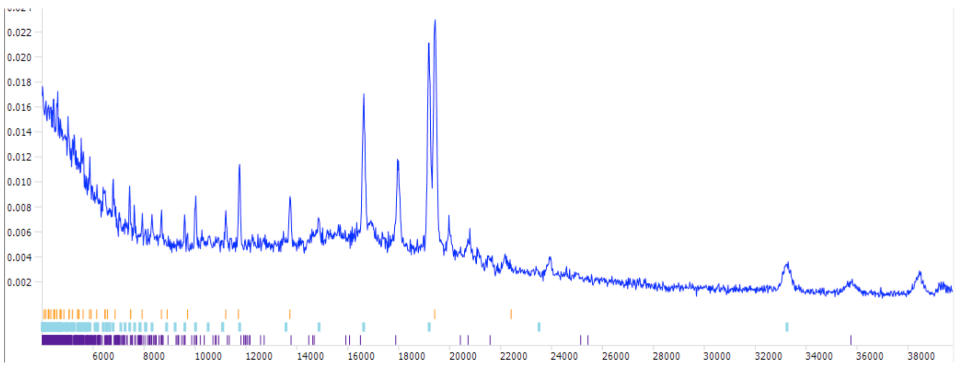

Fig. 3 Diffraction pattern at 15 GPa, 27 purple C. Tick marks are calucurated peak positions of cubic $CaSiO_3$ (cyan), MgO (orange), $LaCrO_3$ (purple).