（ ※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。 ）

MLF Experimental Report	提出日 Date of Report
課題番号 Project No. 2016A0136 実験課題名 Title of experiment Effect of ausforming on martensite transformation 実験責任者名 Name of principal investigator GONG Wu 所属 Affiliation Kyoto University	装置責任者 Name of responsible person AIZAWA Kazuya 装置名 Name of Instrument/(BL No.) TAKUMI/BL19 実施日 Date of Experiment 2016/5/20~5/23 (3.5 days)

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.

A NiCrMoV steel with the chemical composition of Fe-0.30C-3.7Ni-1.6Cr-0.49Mo-0.10V-0.09Si-0.31Mn (wt%) was used in this study.

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.

In-situ neutron diffraction measurements were performed to elucidate the effect of ausforming on phase transformation below martensite transformation start temperature (Ms) in a NiCrMoV steel. The Thermo-Mechanical Control Process (TMCP) experiments were carried out by a thermomechanical treatment simulator installed on BL19 'TAKUMI' in J-PARC. Fig. 1 shows the setup of experiments. The cylindrical specimen with a length of 11 mm and a diameter of 6.6 mm was set up between the anvils. The incident neutron parallel to the radial direction of specimen. Two detector banks with 5 mm-width radial collimators were used to collect the neutron diffraction patterns simultaneous.

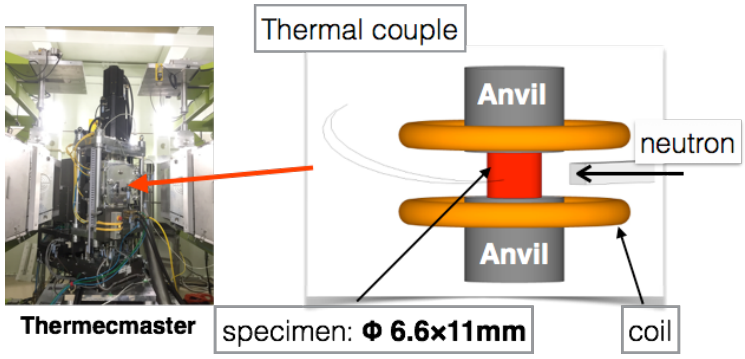

Fig.1 Setup of the high temperature experiments

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

The in situ neutron diffraction experiments during TMCP were successfully performed and the following results were obtained:

(1) Bainitic transformation below Ms was confirmed from the *in-situ* neutron diffraction results. Fig. 2 shows the evolution of diffraction profiles (a) and the change of the volume fraction of BCC phase during the thermal history (b). When the austenized specimen was cooled down to 250°C, approximately 50% austenite transformed to martensite. In the subsequent isothermal holding, the intensity of the 111 FCC peak decreased significantly as the 110 BCC peak intensity increased, which indicated that the retained austenite transformed to bainite. Because martensite is athermal transformation (it is a time-independent process), the present isothermal transformation should be bainite transformation. The later microstructure observation also confirmed this result.

(2) It is found that ausforming has different effect on the kinetics of martensite transfromation and bainite transformation, and thereby change the final microstructures. Ausforming suppressed the kinetics of martensitic transformation but showed a weak effect on the subsequent bainitic transformation. The amount of retained austenite in the specimens at room temperature became larger by ausforming. The mechanical properties of the ausformed and non-ausformed spencimens were compared by tensile test experiments. The ausformed specimen exhibited a tensile strength as high as 2.1 GPa with an elongation of 9 %, which were better than those of the non-ausformed specimen.

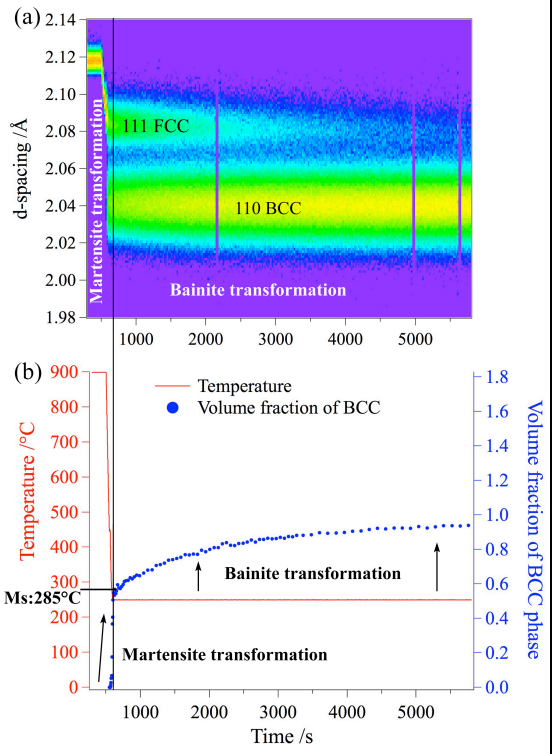

Fig.2 (a) Evolution of 111 FCC and 110 BCC profiles obtained by the in-situ neutron diffraction, and (b) the volume fraction of BCC phase (martensite and bainitic ferrite) during the heat treatment.