（ ※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. 2015A0292 実験課題名 Title of experiment High temperature deformation and phase transformation behaviors in LPSO-type Mg alloys 実験責任者名 Name of principal investigator GONG Wu 所属 Affiliation Japan Atomic Energy Agency	装置責任者 Name of responsible person AIZAWA Kazuya 装置名 Name of Instrument/（BL No.） TAKUMI/ BL 19 実施日 Date of Experiment 2015/11/11 (1 day) 2016/3/23~3/25 (2.5 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.

The chemical compositions of the alloy used in this study are $Mg_{85}Zn_6Y_9$ (at.%). It consists of duplex Long Period Stacking Ordered (LPSO) structure of 18R and 10H.

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.

An as-cast $Mg_{85}Zn_6Y_9$ alloy was investigated by in-situ neutron diffraction during high temperature and annealing at BL19 'TAKUMI' of J-PARC. Fig.1 shows the setup of the high temperature experiments. The cylindrical specimen with a length of 16 mm and a diameter of 8 mm was set up between the jigs in a hot deformation machine. The loading axis angled +45° relative to the incident neutron beam. Two detector banks with 5 mm-width radial collimators positioned at +90° and −90° relative to the incident beam were used to collect the neutron diffraction patterns, which correspond to the axial and radial directions of the specimen. The diffraction patterns were obtained in each 30 seconds during the annealing process and high temperature deformation experiments.

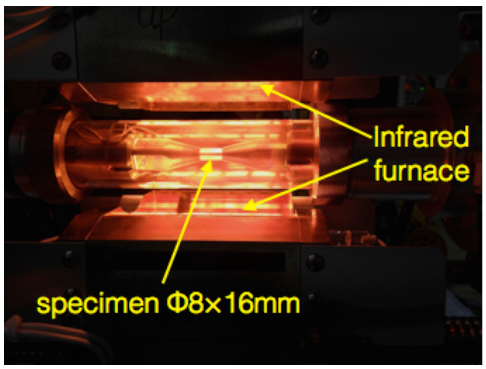

Fig.1 Setup of the high temperature experiments

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

The following in situ neutron diffraction experiments were successfully performed to clarify the phase transformation and high temperature deformation behavior of the LPSO alloys:

(1) An annealing process at 550°C was used to investigate the phase transformation behavior in the $Mg_{85}Zn_6Y_9$ alloy.

During annealing, a structure transformation from 10H-LPSO to 18R-LPSO was observed. Fig.2 shows the diffraction patterns evolution corresponding to the temperature. The temperature route was added on the top axis as reference. The initial microstructure of the alloy consists of 82% (mass) 18R-LPSO (marked by black arrows) and 18% 10H-LPSO (white arrows) phases. When the temperature exceed 507°C, the intensities of the 10H peaks decrease apparently with the increase of the intensities in 18R peaks. The quantitative phase fraction evolution estimated from the diffraction profiles has confirmed the 10H to 18R phase transformation. These results will be presented in PRICM9 (9th Pacific Rim International Conference on Advanced Materials and Processing)

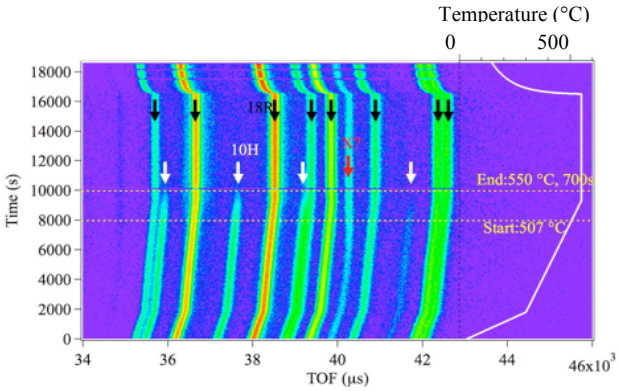

Fig.2 Diffraction profiles evolution during annealing process.

(2) High temperature compression experiments at 200°C and 300°C was performed to clarify the high temperature deformation behavior of the $Mg_{85}Zn_6Y_9$ alloy.

By comparison with the room temperature deformation behavior, the work hardening rate decreases with the increase of deformation temperature, but can obtain a higher elongation at high temperature. More deformation modes including basal slip, prismatic slip and kink deformation were observed at 200°C and 300°C that are the reason for improving the ductility. From the stress transfer behavior at elastic-plastic region, the 10H-LPSO phase yielded at lower stress than that of 18R-LPSO. It indicates that 18R-LPSO is the harder component in the alloy as comparison with 10H-LPSO. These results were presented at "新学術領域「シンクロ型 LPSO 構造の材料科学」H27 年度成果報告会", and received a best poster award. The results will be submitted to academic journal within the year.