J-PARC MLF Experimental Report	提出日 Date of Report 2010.2.15
課題番号 Project No. 2009A0026 実験課題名 Title of experiment In situ investigation of residual strain by Bragg-edge transmission method and diffraction. 実験責任者名 Name of principal investigator Kenji Iwase 所属 Affiliation Ibaraki University	装置責任者 Name of responsible person K. Aizawa 装置名 Name of Instrument/(BL No.) BL19 実施日 Date of Experiment 2009.12.12-14

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.

Fe
Size 100×200×5mm

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.

We try to develop new nondestructive inspection by Bragg-edge transmission combined with diffraction. In the nondestructive inspection, it is important to detect the position dependence of strain and the accurate residual strain in the material, because the break of structural material depend on the position and the quantity of strain. To detect the change of quantity of strain and the position dependence of strain with increasing tensile stress by in situ measurement, which leads to the development new nondestractive inspection. We will carried out Bragg-edge transmission and neutorn diffraction for Fe by a tensile tester.

Typical TOF transmission spectrum of a decoupled-poisoned liquid hydrogen moderator at J-PARC, in this case for Fe plate, compared with the incident spectrum as shown in Fig. 1. These spectra are the sum of data from 256 pixels. The aluminum Bragg cut-off is clearly observed in the incident spectrum, which arises from the aluminum windows of the evacuated neutron guide.

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

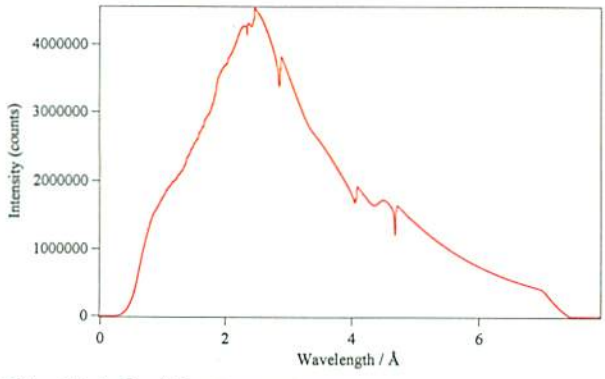

Fig. 1(a) Incident spectrum.

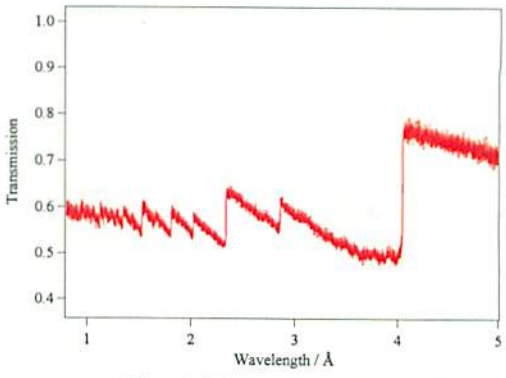

Fig. 1(b) Transmission of Fe.

Fig. 2 shows the transmission of 110 Bragg-edge of Fe plate during the tensile test. The position of No. 138 is the edge of the sample, but No.146 pixel is in the center of the sample. The range of load is from 0kN to 49kN. The Bragg-edge positions shift to decrease with increasing the load. For No. 138 pixel, the detected area may be deformed non-elastically over the load 20kN. For No.146 pixel, only the elastic deformation may be caused during the tensile test. The tendency of the change of the Bragg-edge position is different from the No. 138 pixel.

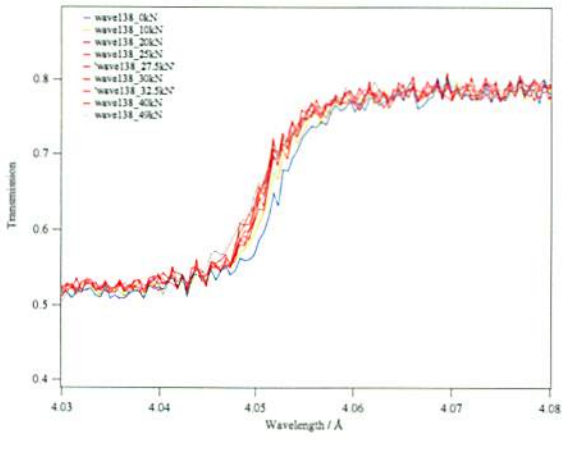

Fig. 2(a) Transmission of No. 138 pixel

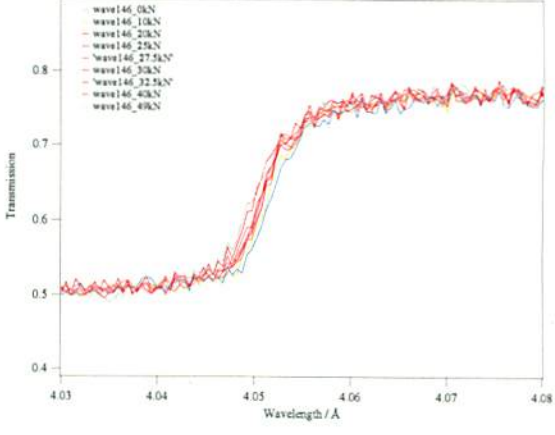

Fig. 2(b) Transmission of No.146 pixel

Bragg-edge transmission method is powerful tool for the change of position dependent. Detailed analysis is underway to clarify the residual strain during the tensile test.