


(※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 2011/6/17
課題番号 Project No. 2010B0042 実験課題名 Title of experiment: Instrumental Characteristics Comparison and Reliability Evaluation of TAKUMI and RESA 実験責任者名 Name of principal investigator Koichi Akita 所属 Affiliation JAEA	装置責任者 Name of responsible person Kazuya Aizawa 装置名 Name of Instrument/(BL No.) TAKUMI (BL19) 実施日 Date of Experiment 2010/12/14-2010/12/15 2011/2/4-2011/2/5

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.
1. Austenite stainless steel, JIS SUS310, Bulk 2. Ferrite/Martensite steel, JIS SCM440, Bulk 3. Aluminum alloy, JIS A7075, Bulk

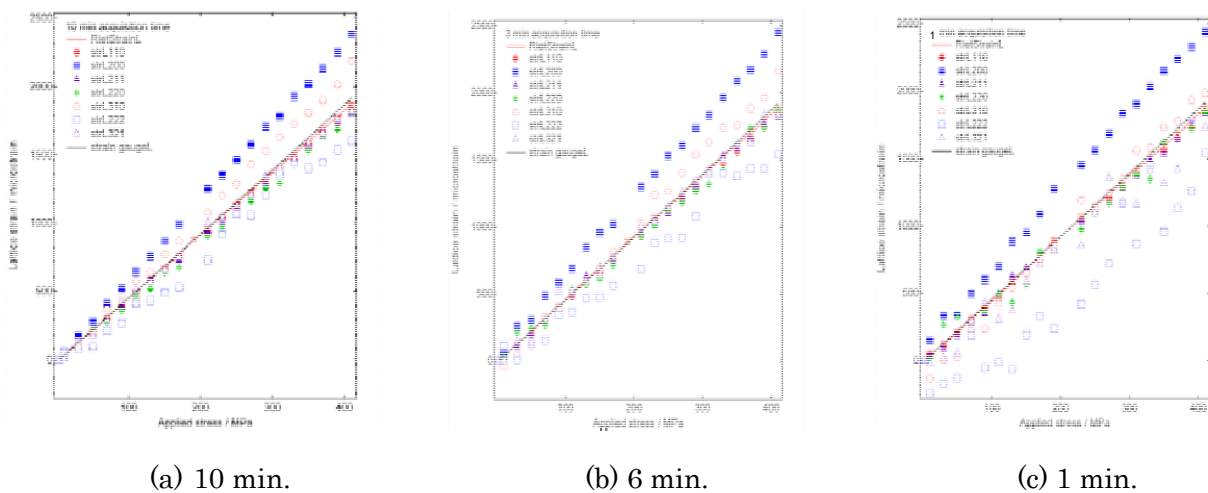
2. 実験方法及び結果 (実験がうまくいかなかった場合、その理由を記述してください。) Experimental method and results. If you failed to conduct experiment as planned, please describe reasons.
Experimental method; Tensile specimens were cutout from the materials by an electro discharge wire-cut machine. A strain gage was glued on the sample surface in the loading direction. Tensile loads were applied step-by-step on the sample using a tension/compression loading device set on the sample stage of TAKUMI. Diffraction profiles were measured at each loading step. Results were compared with the data obtained by the RESA-1. Condition of diffraction measurement is shown in Table 1.

	TAKUMI	RESA-1
Experiment date	2010.11.5	2010.10.11
Beam	Pulsed neutron Beam power: 120 kW	Continuous neutron Reactor power: 20 MW
Diffraction condition	Mid. resolution mode ($\Delta d/d = 0.28$) d-range: 0.39 - 2.64 Å Diffraction angle: 90 deg	Monochromator: Asymm. Si 311 Wave length: 1.6 Å Diffraction: a-Fe 211 (d = 1.17 Å) Diffraction angle: 86 deg
Incident slit	Width: 3mm, Hight: 8mm	Width: 3mm, Hight: 10mm
Receiving slit	-	Radial collimater, W 10 mm
Detector and View angle	1D Scintillator (pair of 90 deg banks) W 3 mm x H 200 mm/pixel Per bank: hor.: ± 15 deg, ver.: ± 15 deg	1D-PSD, 100 × 100 mm ² hor.: ± 3 deg, ver.: ± 3 deg

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

Results;

In this report, the results obtained on SCM440 steel samples were described as a representative example of the experiment. Fig. 1 (a) - (c) show the measured lattice strains plotted against applied stress. Linearity of the strain-stress relation was improved with increasing acquisition time. Standard deviation of the strain-stress relation for 211 diffraction was decreased with increasing peak intensity as shown in Fig. 2. In this figure, the result obtained by RESA-1 in JRR-3 was also plotted for comparison. Standard deviation was about 20×10^{-6} corresponding to 5 MPa in tensile stress at 1000 counts of the peak intensity for both TAKUMI and RESA-1. The time required to store 1000 counts at the experimental condition was about 2 min. and 10 min. on TAKUMI and RESA-1, respectively. Fig. 3 shows the Young's modulus obtained by the tensile tests. The measured values were in good agreement with the theoretical values calculated by Kroner model except for 222 diffraction showed very low peak intensity. Further experiments on the TAKUMI and RESA-1 are required to clarify the characteristics of the both diffractometers.



(a) 10 min.

(b) 6 min.

(c) 1 min.

Fig. 1 Examples of (lattice strain) – (applied stress) relations of SCM440 measured by TAKUMI.

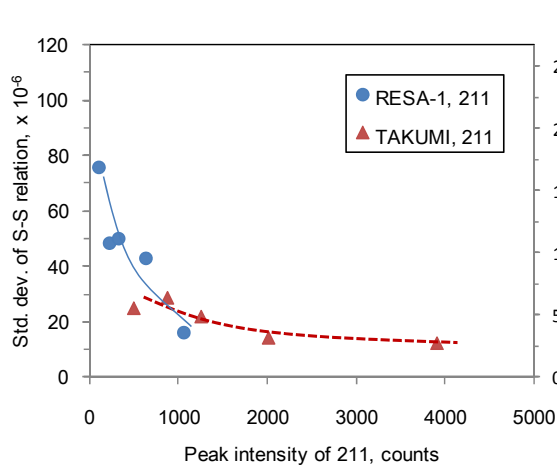


Fig. 2 Standard deviations for strain-stress relation.

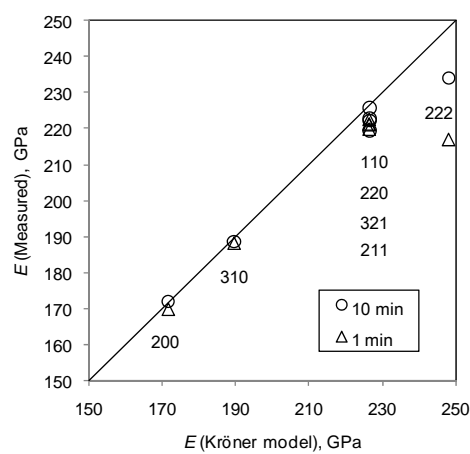


Fig. 3 Comparison between measured and calculated values of Young's modulus (TAKUMI).