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|  MLF Experimental Report | 提出日 Date of Report |
| 課題番号 Project No. 2014A0149 実験課題名 Title of experiment In-situ Residual Stress Measurements on Dissimilar Metal Joint under Cyclic Thermal Loading 実験責任者名 Name of principal investigator Koichi Akita 所属 Affiliation Japan Atomic Energy Agency | 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 21-25/11/2014 |

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.

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| 1. 試料 Name of sample(s) and chemical formula, or compositions including physical form. |
| <p>A welded joint plate was used in the experiment. The materials of the base plate and the weld metal were an austenitic stainless steel, SUS316L, and a nickel alloy, YNiCr-3, respectively. The size of the sample was 100 x 100 x 10 mm³. The sample surface was treated by the ultrasonic shot peening (USP) after welding for introducing compressive residual stress in the surface layer.</p> |

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| 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. |
| <p><Experimental method></p> <p>The sample was heated from RT up to 593 K step by step using a jacket type heater that we developed. Strain mappings around weld bead of the sample were performed using TAKUMI at the elevated temperatures. The gage volume was 2 x 2 x 2 mm³ and was defined by an incident slit and a pair of radial collimators with 2 mm width. Directions of the measured strains were L and N. Measured diffraction data were analyzed using the Rietveld analysis software for J-PARC, Z-Rietveld [1]. Residual stresses were calculated from the strains in L and N directions under the assumption of plane stress condition.</p> <p>[1] R. Oishi, M. Yonemura, Y. Nishimaki, S. Torii, A. Hoshikawa, T. Ishigaki, T. Morishima, K. Mori and T. Kamiyama, Rietveld analysis software for J-PARC, Nuclear Instruments and Methods A600, 94–96 (2009).</p> |

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

<Results>

In this study, relaxation behaviors of the welding residual stress during thermal cycles have been investigated using a neutron stress measurement technique and a FEM method. In the previous experiment in 2012B0168, residual stress behaviors on a dissimilar metal weld joint was measured and the effects of the difference of thermal expansion coefficients of the materials were discussed by comparing with FEM results. In this experiment round, we have conducted the stress measurement on the similar metal joint for comparing with the previous results. On the similar metal joint, inside residual stresses were tension as shown in Fig. 1 (a). The inside tensile residual stresses decreased with increasing temperature (Fig. 1 (b)). After the thermal aging, the tensile residual was recovered but slightly relaxed (Fig. 1 (c)).

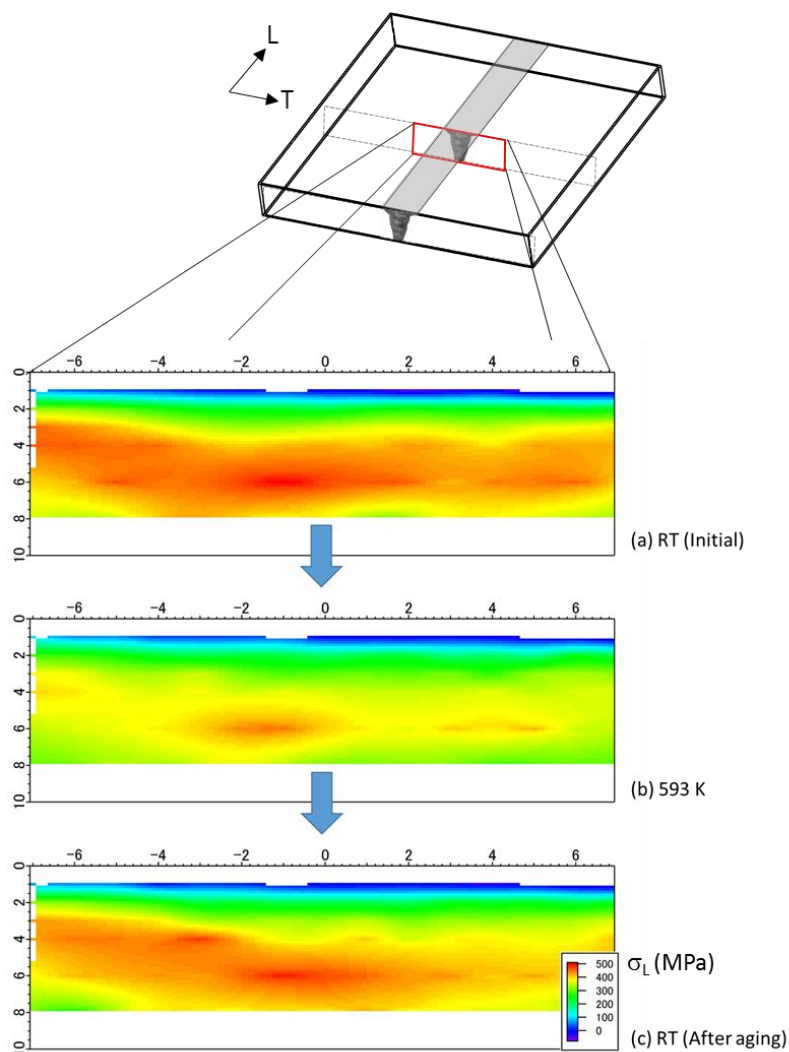


Fig. 1 Residual stress maps on the similar metal weld joint measured by neutron diffraction technique during a thermal cycle.