(※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。)

CROSS TOKAI **Experimental Report** J-PARC	承認日 Date of Approval Jan. 4, 2015 承認者 Approver J. Suzuki 提出日 Date of Report 2014/8/22
課題番号 Project No. 2012BS0002 実験課題名 Title of experiment Feasibility study of SANS measurements of steel samples using sample holder with both stress and magnetic field 実験責任者名 Name of principal investigator M.Ohnuma 所属 Affiliation National Institute for Materials Science	装置責任者 Name of Instrument scientist J.Suzuki 装置名 Name of Instrument/(BL No.) TAIKAN 実施日 Date of Experiment 2013/2/20-2/21

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.

Steel with the compositions of 0.38C-0.18Si-0.63Mn-0.014P-0.006S-0.93Cr-0.17Mo in wt %.

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.

This experiment was conducted for establishing the way to measure the hydrogen effect on the scattering profiles in steel samples. Hydrogen can concentrate the place where the local tensile stress exists. If the local concentration is high enough around 1 at%, we have good chance to detect signal from that area in small angle scattering region because of large contrast in scattering length density due to the negative scattering length of hydrogen. For discussing such effect, we need to establish the way to charge hydrogen, carry them in LN2 temperature and measure SANS in magnetic field, all through under the stress. For satisfy those requirements, we designed small sample holder which can keep stress up to 600 MPa (Fig. 1). In this experiment, we charged the hydrogen to the samples electrochemically in NIMS and brought them to the J-PARC using LN2 pot and measured the SANS profiles under 0.6T. After 1st measurement, we annealed sample around 200°C for a few hours that cause hydrogen desorption, then, measured SANS for comparing the profile before hydrogen desorption process.

Figure 2(a) shows the SANS profiles with hydrogen charge under tensile stress. The first purpose for this feasibility study is check whether we can separate nuclear component using this sample holder or not. As shown in Fig.2(a), The scattering intensities parallel and perpendicular direction to the applied magnetic field show clear difference. This indicates that the nuclear component is properly separated using our sample holder made by nonmagnetic stainless steel below $q=0.1A^{-1}$. However, higher than 0.2 A^{-1}, background level seems to be higher than the signal from the sample. This is the weak point of the experiments because the

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

In conclusion, we established the way to measure hydrogen charged steel samples under stress. Nuclear component was properly separated by applying magnetic field with permanent magnet. The newly designed sample holder is enough compact to put it hydrogen charge system, LN2 pot and the bore of permanent magnet. However, no difference was observed between the samples with and without hydrogen. For confirming the reason, we need more experiments for suppressing background, different compositions of the samples or annealing conditions.

Fig. 1 Sample folder for measureing SANS under stress and magnetic field

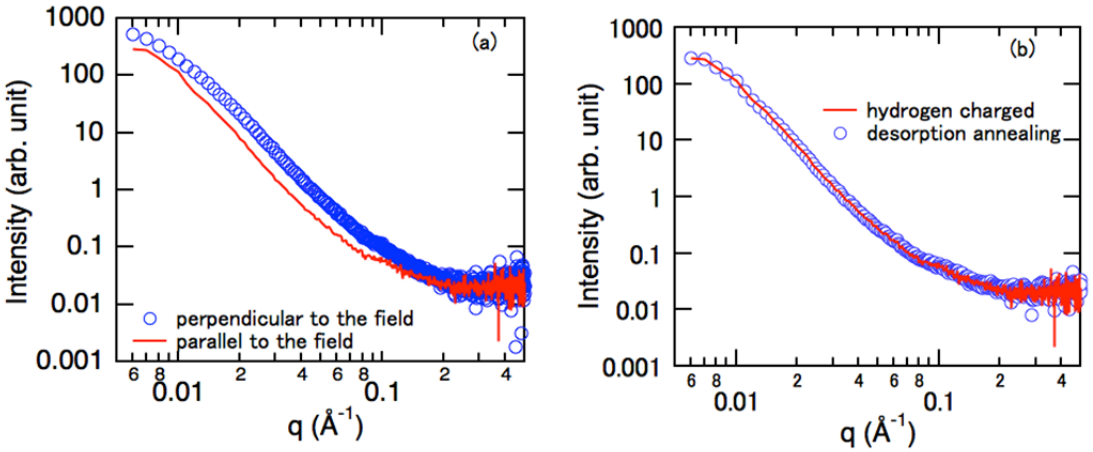

Fig. 2 (a) SANS profiles under 600 MPa and 0.6T, (b) nuclear component of SANS profile under 600MPa before and after hydrogen desorption annealing