実験報告書様式（一般利用課題・成果公開利用）

（ ※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 2015/01/04 承認者 Approver Jun-ichi Suzuki 提出日 Date of Report 2014/09/05
課題番号 Project No. 2012B0006 実験課題名 Title of experiment Characterization of nano-size hetero-structure of H C, and N in the steel by combined use of SANS and SAXS 実験責任者名 Name of principal investigator Masato OHNUMA 所属 Affiliation National Institute for Materials Sciecnce	装置責任者 Name of Instrument scientist Jun-ichi Suzuki 装置名 Name of Instrument/(BL No.) TAIKAN (BL15) 実施日 Date of Experiment 2013/2/11-2/13 、 2013/2/20-2/22

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.

Steels, called SKD61 (0.4C-1SI-0.45Mn) with three different heat treatments.

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 are proposing the combined use of SAXS and SANS for getting the compositional information of hetero-structure embedded in the matrix. Using this technique, we can discuss about the formation mechanism of hetero-structure from the very beginning stage. Here, we focus on the carbon distribution in the typical tool steel, SKD61. Depending on the quenching rate, it shows different mechanical properties. Figure 1 shows the SAXS profiles of SKD61. Interestingly, quenched sample shows quite different profiles of other slow cooling samples. For understanding this behavior, we measured SANS of these three samples. Figure 2 shows SANS profiles of parallel (nuclear) and perpendicular (nuclear and magnetic) component to the applied magnetic field. Sample code with 103517, 103518 and 103520 correspond to quenched, slower, and slowest cooling samples. Unfortunately, no difference was observed in both directions. The reason of the difference between SANS and SAXS is not clear yet.

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

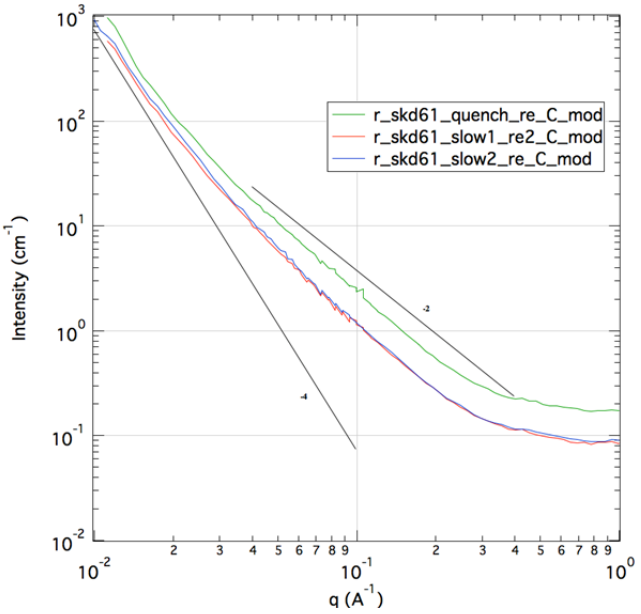

Fig.1 SAXS profiles of SKD61 with different cooling rate. Lines are the eye guide of q^{-4} and q^{-2} dependence.

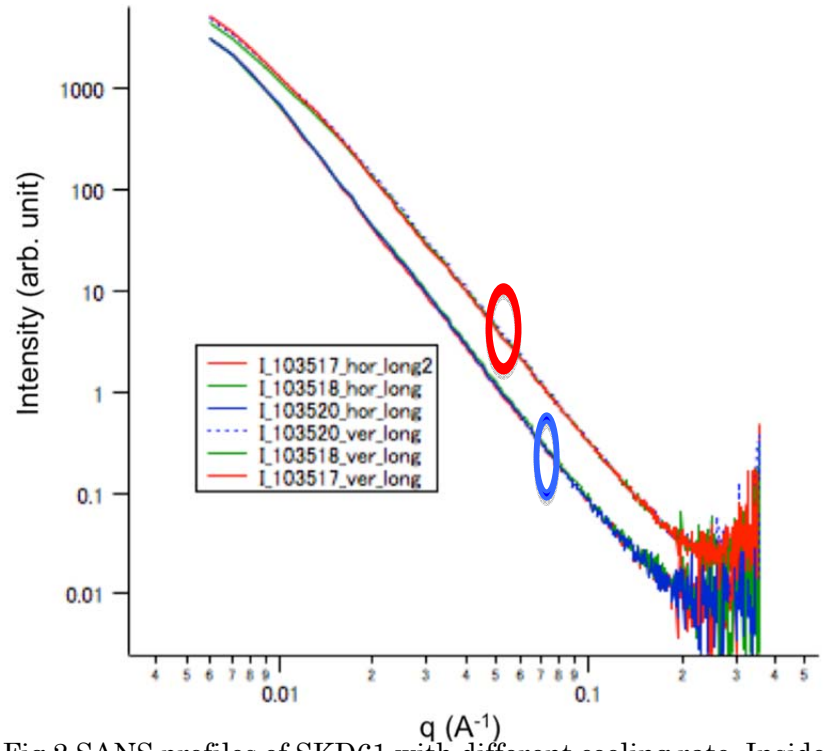

Fig.2 SANS profiles of SKD61 with different cooling rate. Inside red circles, SANS profiles of magentic and nuclear component of three different cooling rate. In blue circles three profiles with nuclear component are overlapped.