

実験報告書様式(一般利用課題・成果公開利用)

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課題番号 Project No.2016B0163 実験課題名 Pulsed neutron imaging to develop a method to identify a type of 'Tsukurikomi' of a Japanese sword and to obtain spatial distribution of crystallographic characteristics of Japanese swords for a study of produced crack 実験責任者名 Yoshiaki Kiyanagi 所属 Nagoya University	装置責任者 Takenao Shionohara 装置名 RADEN/(BL 22) 実施日 11-13 Feb. 2017

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.

The samples were three fragments of Japanese swords. They were made of iron. Photos of two of samples are shown below. The left sample is Mukutsukuri (monolith) and the right one is Honsanmai (composed of three kinds of iron).



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 performed pulsed neutron transmission to obtain the Bragg edge spectra. There are various types of forging type for the Japanese sword, Tsukurikomi. Various kinds of the Tsukurikomi have been recognized, and they would change depending on age and area (sword school). If we can identify the type of the Tuskurikomi, it will be helpful to clarify the history of the sword making. As the first attempt we tried to obtain the Bragg edge transmission depending on the position. We expected to observe the change of the crystallographic characteristics among different type of the Tsukurikomi.

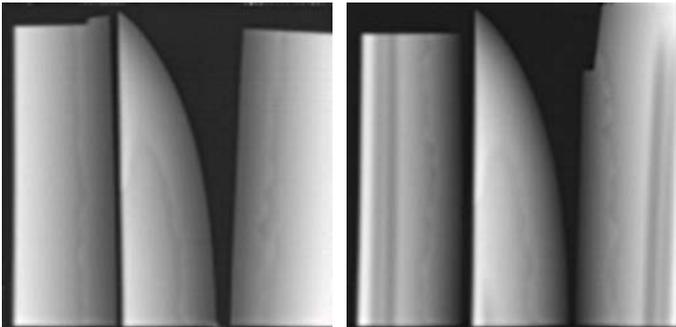


Fig. 1 shows the traditional transmission images of two swords. Fig.1 (a) is Mukutukuri and (b) Honsanmai. We can see Hamon like patterns.

Fig. 1 Photos of (a) Mukutukuri and (b) Honsanmai

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

However, there is no characteristic difference between the transmission images.

Fig. 2 shows an example of the Bragg edge transmission. The largest Bragg edge corresponds to a lattice plane (110). We preliminary analyzed the peaks and deduced edge broadening information viewed from an edge side. There are no characteristic difference between these two types of samples.

We will analyze the whole transmission spectra to deduce crystallographic information of crystallite size and preferred orientation, since this kind of information will reflect the forging process such as the number of the hammering, heating, etc. In the Honsanmai sword, crystallographic characteristics of each iron type may differ each other. Therefore, it may be helpful to distinguish the type of Tsukurikomi.

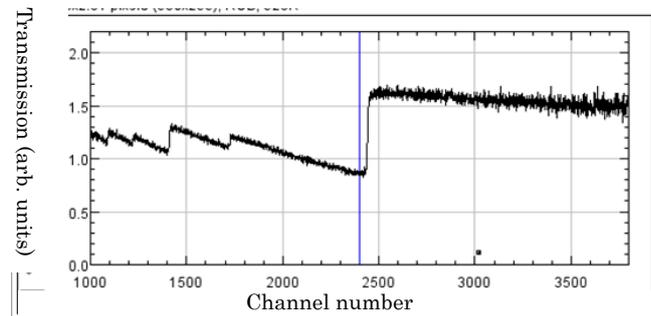


Fig. 2 An example of Bragg edge transmission spectrum

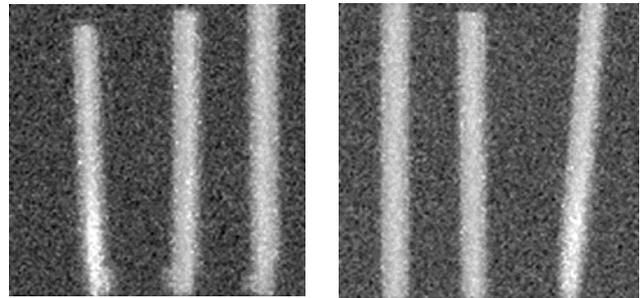


Fig. 3 Edge broadening of Mukutsukuri (Left) and Honsanmai (Right) sample