

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。)

 	承認日 Date of Approval 2017/12/12 承認者 Approver Takenao Shinohara 提出日 Date of Report 2017.12.11
課題番号 Project No. 2016B0264 実験課題名 Title of experiment Nondestructive study of traditional Japanese matchlock guns using energy selective neutron CT to clarify material properties and manufacturing techniques 使用する実験装置の台数 1 台 実験責任者名 Name of principal investigator Manako Tanaka 所属 Affiliation Showa Women's University (The state of the experiment: Tokyo University of theArts)	装置責任者 Name of responsible person Takenao Shinohara 装置名 Name of Instrument/(BL No.) BL22 実施日 Date of Experiment 03/06/2017 9:00~03/08/2017 7:00

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) Fragment of Japanese matchlock gun (muzzle), Fe, solid, 1cm, 8g (1) Fragment of Japanese matchlock gun (rear), Fe, solid, 1cm, 10g

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>We applied for the experiment to deliver an energy selective neutron CT experiment to clarify material properties and manufacturing techniques of traditional Japanese iron artifacts such as matchlock gun, but because of the adopted beam time allocation (two days), we changed the details of our experiment as it's impossible to deliver an energy selective neutron CT just in two days. Instead, we delivered a pulsed neutron imaging using TOF methods. We analyzed two fragments (rear and muzzle) of traditional Japanese matchlock gun from three different directions at J-PARC/MLF BL22 which will accomplish the main purpose of my application. A 2D-PSD, MCP (the spatial resolution: 55µm, detection area: 2.8cm×2.8 cm), was used to get the spatial dependent TOF data.</p> <p>【Results】</p> <p>We could get neutron transmission images of two fragments (muzzle and rear) of traditional Japanese matchlock gun from three different directions as shown in Fig.1 Fig.2 shows narrow energy (just before 110 edge of αFe) spectrum images of the samples. There are a lot of macro crystallites are seen in both samples, especially in the muzzle. We judged them as macro crystallites because we see them only before the last Bragg edge and nothing is seen past the 110 Bragg edge. The area and the</p>

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

amount of the macro crystallites almost match the optical-microscopic observation of the samples. Fig.3 shows the mapping of the strain (calculated by the Bragg edge position) of the samples by three different directions. We are still analyzing the data and the further consideration is needed, but on the whole, we could get very meaningful results through the experiment.

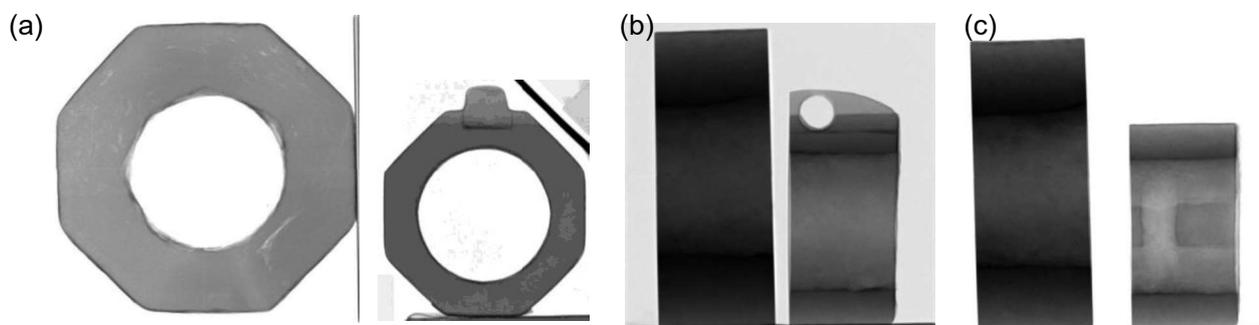


Fig.1 Neutron transmission Images (full spectrum images) of the fragments of traditional Japanese matchlock gun (rear: left and muzzle: right) by three different directions (a), (b), and (c).

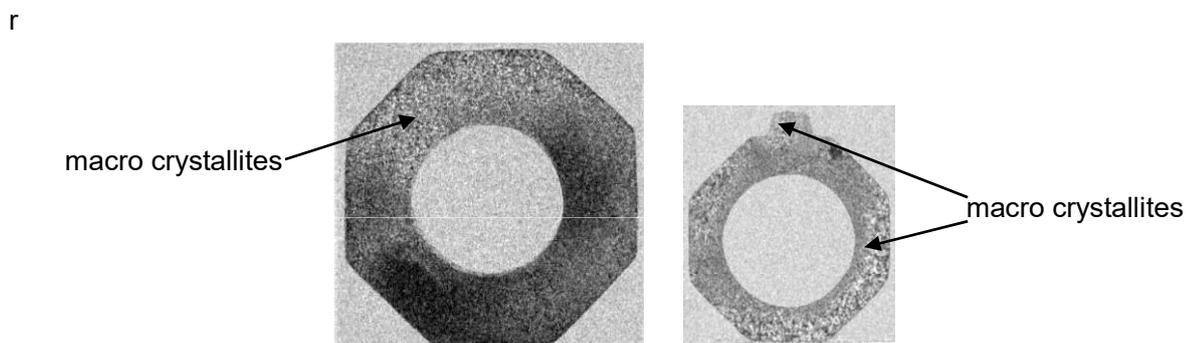


Fig.2 Neutron transmission Images (narrow energy, just before 110 edge of α Fe) of the fragments of traditional Japanese matchlock gun (rear: left and muzzle: right).

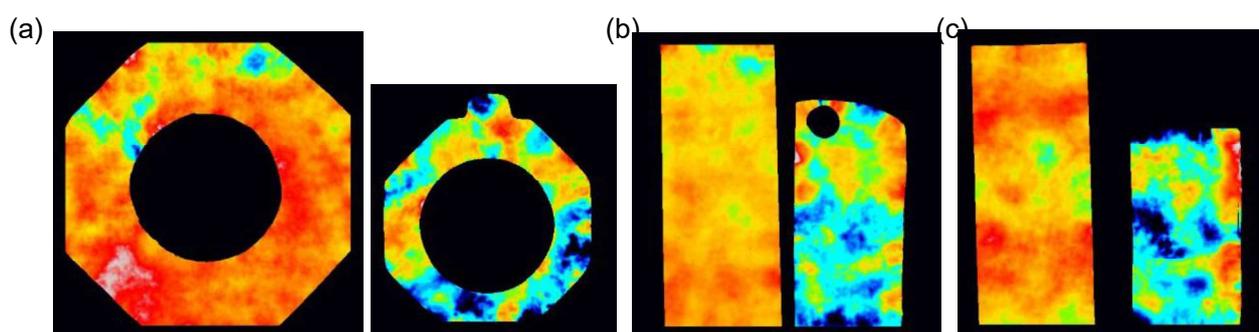


Fig.3 The mapping of the strain (calculated by the Bragg edge position) of the samples by three different directions (a), (b), and (c).