

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。)

 Experimental Report 	承認日 Date of Approval 2016/07/12 承認者 Approver Dai Yamazaki 提出日 Date of Report 2016/07/04
課題番号 Project No. 2014A0002 実験課題名 Title of experiment Additional tests of neutron reflection tomography to visualize surface and interfaces in multilayers 実験責任者名 Name of principal investigator Kenji Sakurai 所属 Affiliation National Institute for Materials Science	装置責任者 Name of Instrument scientist M. Takeda 装置名 Name of Instrument/(BL No.) BL17 実施日 Date of Experiment April 22–24, November 3–5, December 1–2, 2014 (total 4.5 days)

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.

<p>1. 試料 Name of sample(s) and chemical formula, or compositions including physical form.</p> <p>A patterned layered thin film (coated by Ni and Ti on Si wafer)</p>
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<p>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。)</p> <p>Experimental method and results. If you failed to conduct experiment as planned, please describe reasons.</p> <p>The present work is basically the continuation of 2013A0227, which we intended very early-stage trials to collect reflection projections from inhomogeneous thin films. As has already been achieved in our previous X-ray work, the reflectivity technique can be extended to imaging, though such experiments had never been attempted in the neutron scattering field. Instead of the single slit scan, which was tried in the previous beamtime (2013A0227), in the present research, we have developed and employed several types of coded mask made of cadmium. We scanned the coded mask (15 slots) in front of the ^3He detector to obtain the one dimensional intensity profile of the neutron reflection from the patterned sample. The advantage is much higher counting rate leading to better statistics. As the opening of the coded mask is nearly 50 %, in the present 15 slots case, the average intensity has become 7.5 times stronger. Furthermore, the position of the ^3He detector was moved from the standard 18 m point to the 16.3695 m point (in the additional vacuum chamber for the magnetic experiment), to widen the neutron wavelength range and to gain more intensity. We were able to measure the reflection intensity profile of inhomogeneous patterned sample from two different in-plane angles, at 0 deg and 90 deg.</p>
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2. 実験方法及び結果(つづき) Experimental method and results (continued)

It has been found that the obtained results were well interpreted and were able to be produced by calculation as well. Not only in X-ray reflectivity but also in neutron reflectivity, the imaging experiment is possible. The present work has proven for the first time that the coded mask can help this.