

 MLF Experimental Report	提出日 Date of Report
課題番号 Project No. 2016A0059 実験課題名 Title of experiment Feasibility test of micro-PIC detector for neutron reflection imaging 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 responsible person K. Oikawa 装置名 Name of Instrument/(BL No.) BL10 実施日 Date of Experiment December 17-21 (total 3.5 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 follows a series of previous research (2015A0011, 2014B0002, 2014A0002 and 2013A0227, all of them done at BL17) aiming at extending the conventional neutron reflectivity to give spatial resolution necessary for visualizing the buried inhomogeneous interfaces of layered thin films. In the present experiment, we moved to BL10 to use high-resolution 2D detector, micro-PIC detector, while our previous research used the combination of the coded mask and ^3He detector. For the experiment at BL10, we brought our lab's reflectometer and installed in front of the micro-PIC detector as schematically shown in Figure 1. As the experiment was for the first time, we spent time and efforts to establish the detailed protocol and scheme of the experiment. Figure 2 shows an example of the obtained neutron reflection Image.</p> <div data-bbox="837 1579 1428 1892" data-label="Diagram"> </div> <p>Figure 1 Schematic layout of neutron reflectivity imaging</p>
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2. 実験方法及び結果(つづき) Experimental method and results (continued)

Even in the first preliminary tests, we were able to obtain 36 reflection projections from the patterned sample, which we already tested in May 2016 at BL17. Some clearly reconstructed images were successfully obtained. From the next beamtime, we will do neutron reflectivity and neutron reflectivity imaging experiments in a routine way. On the other hand, the image data taken by micro-PIC detector require some subsequent processing by the detector specialist. Therefore later we will do some quantitative comparison with our previous data, and clarify the advantages of the use of micro-PIC detector. We expect that the spatial resolution can become at least 2-3 times better. In the 2016B beamtime, we will get further results.



Figure 2 Example of neutron reflection projection image

The right thin line image is from the thin film sample, while the left thick one is direct beam.