


(※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。)

 MLF Experimental Report	提出日 Date of Report 2013 June 26
課題番号 Project No. 2012B0070 実験課題名 Title of experiment Study of Diffuse Reflection for the Characterization of Candidate Materials of Ultracold Neutron Storage Cell 実験責任者名 Name of principal investigator Tamaki Yoshioka 所属 Affiliation Kyushu University	装置責任者 Name of responsible person Norifumi Yamada 装置名 Name of Instrument/(BL No.) BL16 実施日 Date of Experiment 2013 March 12

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.
Diamond-Like Carbon (C, D)

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>We measure the fraction of the diffuse reflection by observing the neutrons detected out of the specular region on the detector plane. One-dimensional distribution on the detector plane will be observed as a function of the neutron time-of-flight. We will convert the projected distribution of the vertically incident UCNs. We are interested in the UCN reflection in the velocity range of 0–3 m/s, with the velocity step of 1 m/s or smaller, which corresponds to the angular resolution of 1 mrad or smaller for the incident velocity of 1000 m/s. We are going to adjust the beam divergence 1 mrad or smaller so that we clearly identify the specularly reflected neutron.</p> <p>We took data for xx samples of diamond-like carbon thin film coated on the silicon wafer. We made the diamond-like carbon samples using our coating machine by changing various parameters such as bias voltage. In order to understand our diamond-like carbon, we firstly evaluated the Fermi potential which is also very important parameter of a neutron mirror. Figure 1 shows neutron reflectivity as a function of the q value.</p>

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

We obtained the Fermi potential of 243 neV whose file was coated by the low gas flow condition and this value is the highest one ever achieved. We also evaluated the film thickness by the neutron data, and those values are compared by those measured by X-ray reflectometer. The result is shown in Figure 2, and we found good correlation between the two measurements.

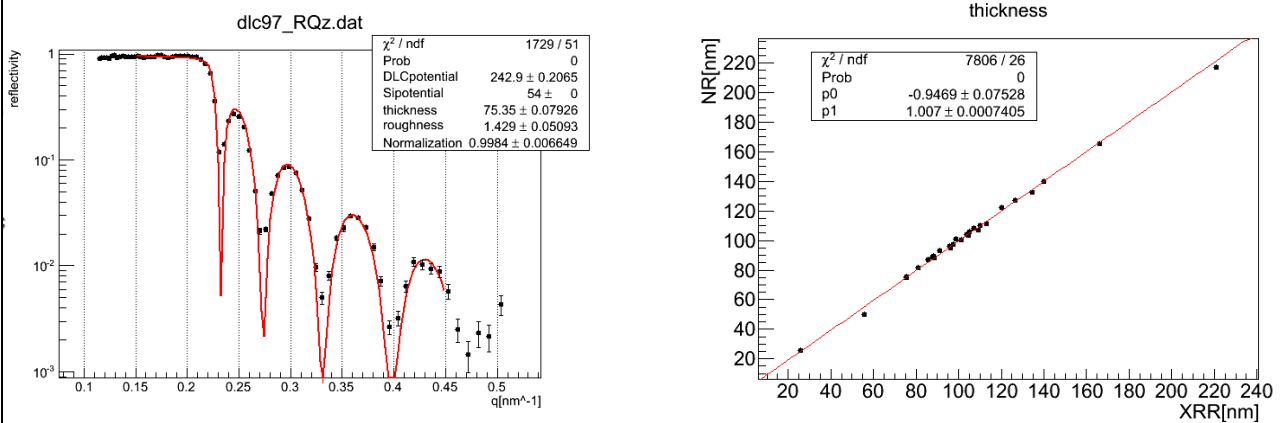


Figure 1 (Left) : Measured neutron reflectivity. This result shows the Fermi potential of 243 neV which is the highest value achieved so far. Figure 2 (Right) : Film thickness measured by neutron (y-axis) and X-ray (x-axis).

In this time, we have also created a multi-layer super mirror which is an alternate structure of the normal diamond-like carbon and deuterated diamond-like carbon. We have created 2 layer and 4 layer super mirror and measured the neutron reflectivity. The result is shown in Figure 3. We also took the data for study of diffuse scattering, and the detailed analysis is still on-going.

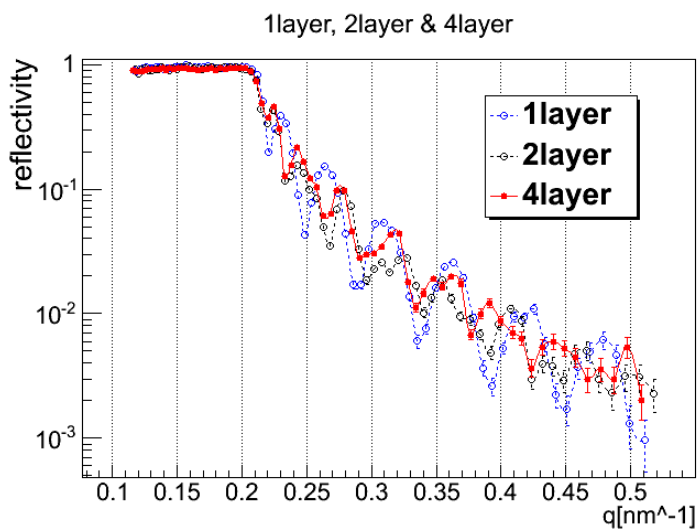


Figure 3 : Result of neutron reflectivity measurement of the diamond-like carbon multi-layer super mirror.