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。)

CROSS TOKAI **Experimental Report** J-PARC	承認日 Date of Approval 2013/12/10 承認者 Approver Takeda Masayasu 提出日 Date of Report 2013/12/10
課題番号 Project No. 2012B0131 実験課題名 Title of experiment Study of role of interface structure in solar cell through polarized neutron reflectometry 実験責任者名 Name of principal investigator Kubota Masato 所属 Affiliation; JAEA	装置責任者 Name of Instrument scientist Takeda Masayasu 装置名 Name of Instrument/ (BL No.) BL17 実施日 Date of Experiment 3月11日 9:00 - 3月13日 9:00; 3月13日 21:00 - 3月16日 21:00;

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.

Poly(3-Hexylthiophene)/Phenyl-C61-Butyric Acid Methyl Ester C72H14O2,C10H14S

Thin film 50mmφ

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.

Recently, the conversion efficiency of organic solar cell thin film has become higher. However, improvement of the durability is crucial to solve issues to be dealt with over decades in the aim of the commercialization. Organic solar cells have problems that the performance is likely to deteriorate under the influence of heat, moisture and oxygen, compared with silicon-based solar cells.

On the functionality of organic solar cells such as durability and conversion efficiency, we need to consider that a bulk heterostructure emerges by mixing of acceptor material

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

with donor material, which causes contacts of pn heterologous molecule in the whole film. Therefore, the structure at interfaces has a strong correlation with the durability and the conversion efficiency. Considering these things, we perform neutron reflectometry to determine internal structures in solar cell thin film; we use the hybrid system of regioregular poly (3-hexylthiophene) (P3HT) and [6,6]-phenyl-C61-buteric acid methyl ester (PCBM), in which the former is a p-type semiconductor, whereas the latter is n-type semiconductor. We have fabricated solar cell film and then, mounted the thin film onto a sample holder.

We investigate the influence of an annealing condition of the solar cell films. Sample A is an as-grown sample, while sample B is annealed at 80 ℃ in the process of the fabrication, in advance. The reflectivity data are shown in Fig. 1.

Although the periodicity of the sample varies, the slopes of the reflectivity data are almost the same. By the model calculation, the thickness changes from 795 Å to 825Å, while the roughness of about 10Å remains. It seems that the thin film is robust against the annealing at 80 ℃, which is below glass transition temperature.

We will proceed to compare reflectivity data after annealing above glass transition temperature with the present data.

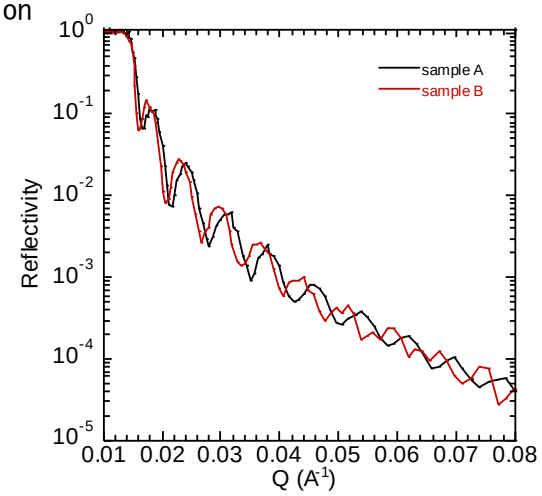

Fig. 1