
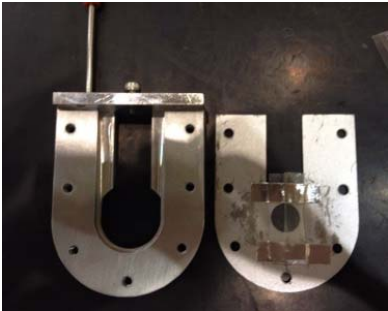


(※本報告書は英語で記述してください。ただし、産業利用課題として採択されている方は日本語で記述していただいても結構です。)

	提出日 Date of Report 2012.9.3
課題番号 Project No. 2012A0019 実験課題名 Title of experiment Precise Analysis for shish-kebab structure with various molecular weight components 実験責任者名 Name of principal investigator Go Matsuba 所属 Affiliation Yamagata University	装置責任者 Name of responsible person Jun-ichi Suzuki 装置名 Name of Instrument/(BL No.) BL15 実施日 Date of Experiment 2012.6.22-25

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>Polyethylene Blend: The molecular weight of blended deuterated and protonated polyethylene was 600 k and 2M. The blending ratio was 97:3 by weight. These polyethylenes was dissolved into dichlorobenzene at 160 °C and participated into methanol. The blended samples were melt pressed, therefore we got the isotropic films. The films were extended in drawing rate, 5 mm/min, and temperature at 125 °C after annealing for 10 min. The drawing ratio (DR) was 1.00 (isotropic sample), 1.07, 1.39, 2.20, 2.87 and 6.00. Figure 1 shows the drawing polyethylene filme (DR = 1.39) and aluminum sample cell.</p>  <p>Figure 1: Drawing polyethylene on the sample cell.</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>Experimental Method: These sample films were put on the sample cell as shown in Figure 1. They were set on the sample changer in the TAIKAN spectrometer. The exposure time was between 2 hours and 4 hours. These scattering profiles were transported into 2D scattering profiles by Taikan software. Then these profiles were corrected by vanadium scattering one and subtracted the background data.</p>
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## 2. 実験方法及び結果(つづき) Experimental method and results (continued)

Results:

Figure 2 shows the 2D profiles in various DR conditions. The drawing is meridional direction of these 2D profiles. Before drawing (DR = 1.0), the isotropic scattering pattern was observed. In DR = 1.07, the structural change by drawing was quite not so strong that the scattering pattern is almost isotropic. After DR = 1.39, we could observe the scattering parallel to the drawing, then kebab structure. The yielding point is DR = 1.39, then the lamella orientation could be occurred. After the yielding point (DR > 1.39), the streak-like scattering profiles normal to the drawing direction were observed in DR = 2.20, 2.87 and 6.00. The streak-like scattering profiles might be caused by the nano-scale shish structure and/or micron-scale fibril-like structure.

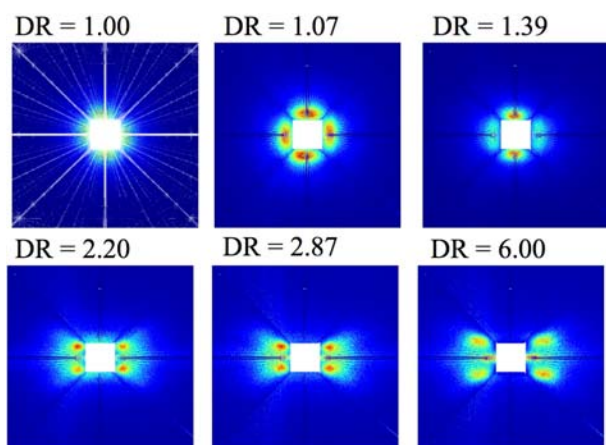


Figure 2 2D SANS profiles.

For more detailed analysis, we calculated 1D profiles in various DR conditions. In Figure 3, the DR evolution of the sector averaged SANS intensity in the scattering vector,  $Q$ . The sector angle is  $\pm 120^\circ$  ( $0^\circ$  is the equatorial direction). In the low DR conditions, we could find the peak from the lamella (kebab) structure in  $Q = 0.01 \text{ \AA}^{-1}$ , while in the high DR, the peaks from lamella disappeared and the shoulder grew in  $Q = 0.05 \text{ \AA}^{-1}$ . This suggests that the nano-scale shish structure emerged and grew up. Now we try to analyse the profiles in high  $Q$  (WANS).

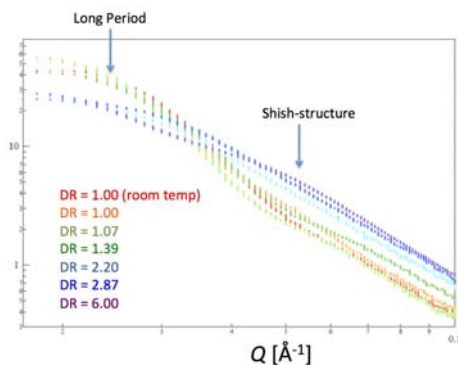


Figure 3 DR evolution of SANS profiles.