X-ray Microdiffraction for Polymer Materials at BL24XU of SPirng-8

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In SPring-8, hard X-ray microbeam, which was obtained by phase zone plate made of tantalum, is in operation at the Hyogo-BL (BL24XU hutch C1). We have investigated the skin/core structure of polymer single fiber using an X-ray microbeam. In this study, as the further application of hard X-ray microbeam, localized microstructures of polymer/polymer interface was measured by X-ray microdiffraction method.

Laminated polymer films were obtained by the melt-pressed linear low-density polyethylene (PE) and isotactic polypropylene (PP). A position and a tilt of the film were precisely adjusted by monitoring the intensity of Thomson scattering from the sample as shown in figure 1. X-ray beam was aligned parallel to surface of the laminated film. By changing the sample position, diffraction patterns can be obtained from PE/PP laminated films with 0.9 micron (vertical) × 1.7 micron (horizontal) beam at the 15keV in a five minutes per pattern by imaging plate.

Figure 2 shows the X-ray diffraction profiles of the laminated films. Changing the sample position relative to the microbeam across the interfacial region. Approaching to PP side form PE side, the diffraction intensity of PP gradually increased. According to these results, it was indicated that the laminated film possesses an interphase region with a few micrometers thickness.

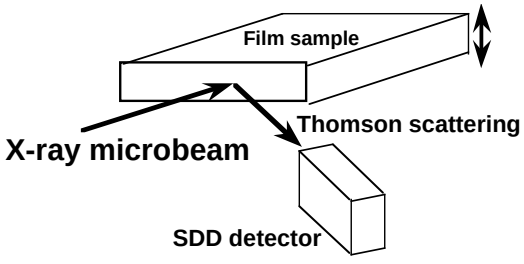

Fig.1 Schematic representation of the X-ray microdiffraction method for film sample.

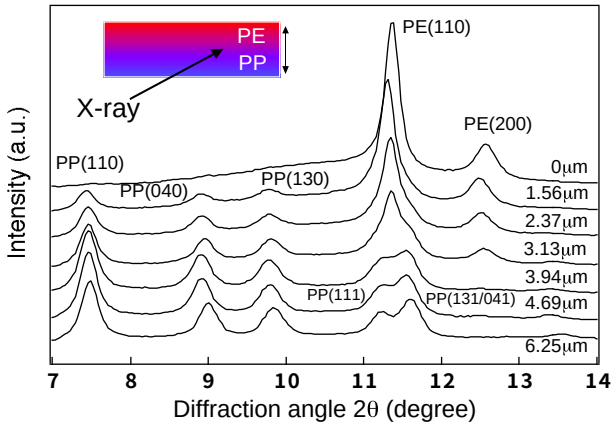

Fig.2 X-ray diffraction profiles of PE/PP laminated film.