

***In-situ* Structural Analysis of BPDA-PPD Polyimide Thin Film using Two-dimensional Grazing Incidence X-ray Diffraction**

J. Kikuma, T. Nayuki, G. Asano and S. Matsuno

Analysis and Simulation Center,

Asahi-KASEI Corporation

Chemical and structural changes during the curing processes of polyimides have been of great interest for decades. Although a lot of studies have been carried out for the crystal structure and growth along with imidizations, there are only a few studies that investigate curing process of polyimides *in-situ* [1,2]. In this work, we have investigated the structural evolution of BPDA-PPD poly(amic acid) using grazing incidence x-ray diffraction (GIXD).

Experiments were carried out at the BL24XU in the SPring-8, using x-ray wavelength of 0.124 nm. The pre-baked wafer samples were cured on a hot stage with a dome-shaped x-ray window made of poly(ether ether ketone) (PEEK). *In-situ* GIXD measurements were carried out during both heating and cooling processes under a nitrogen gas flow. A series of GIXD images were obtained with an imaging plate at each curing step. From two-dimensional diffraction images, both in-plane and out-of-plane XRD patterns can be obtained simultaneously. Azimuth angle dependences were also obtained for each reflection.

Figure 1 shows GIXD pattern obtained at 400 C. It is clearly shown that the (00*l*) reflections appear in the in-plane direction while (*hk*0) reflections appear in the out-of-plane direction. It is also clear that (110) has less azimuth angle dependence than other (*hk*0) peaks. The degree of crystallinity and packing behavior during cooling process will be also discussed.

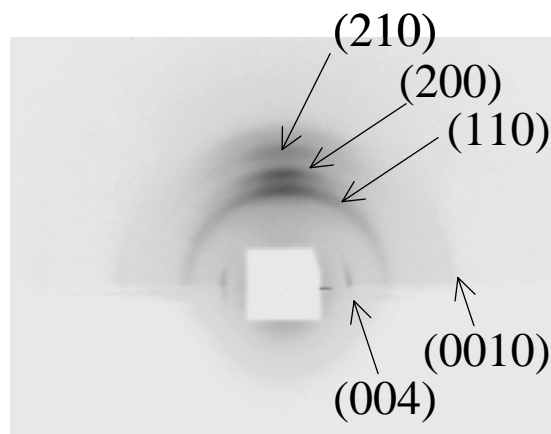


Fig. 1. A two-dimensional GIXD image of BPDA-PPD obtained at 400 C.

[1] M. Ree et al., *Macromol. Symp.*, 118, 213 (1997).

[2] T. J. Shin, B. Lee, H. S. Youn, K.-B. Lee and M. Ree, *Langmuir*, 17, 7842 (2001).