Crystalline Structure of Biodegradable Polyhydroxybutyrate thin Films

Katsuhito Mori[a], Harumi Sato[a], Hikaru Terauchi[a], Isao Takahashi[a], Yukihiro Ozaki[a], Isao Noda[b], *[a]School of Science and Technology, Kwansei Gakuin University, Japan. [b]The Procter and Gamble Company, U.S.A.* E-mail: scbc0010@ksc.kwansei.ac.jp

Polyhydroxybutyrate: PHB and random copolymer, Polyhydroxyalkanoates: PHAs are crystalline biodegradable polyesters. As a substitute for petrochemical materials, the study of biodegradable polymer has attracted considerable attention. Our recent study demonstrated that melting behavior of a new random copolymer, Poly(3-hydroxybutyrate-co-3-hydroxyhexanoate): P(3HB-co-3HHx) showed a sharp contrast with that of PHB. A novel intermolecular interaction successfully explained the results.

As a next step, we are now conducting the X-ray reflectivity (XR) and grazing incidence X-ray diffraction (GIXD) measurements of thin films of PHB and P(3HB-co-3HHx) at various temperatures. The aim of this study is to get information on morphology, crystallinity, and crystal structure in the surface and thin films, which must be crucial for understanding the physical properties peculiar to the surface region and the mechanism of bio-degradation on a microscopic standpoint.

Both PHB and P(3HB-co-3HHx) thin films indicated that the crystallites tend to orient their *b*-axis along the surface normal direction. The present results strongly support the intermolecular interaction along the *a*-axis direction, which was suggested by the previous study on bulk samples. According to Bragg reflection from the near-surface region, surface morphology of PHB is different from that of P(3HB-co-3HHx) even at room temperature. We will also discuss the results of FT-IR spectrum obtained from the thin films.

Keywords: biodegradable polymer, x-ray diffraction, thin film