学位論文内容の要旨（英文）
Thesis Abstract (English)

Yohanes Windu Widhianto

１．論文題目（英文）

Thesis Title (English)

New material design of multi-stereo block poly(lactic acid)s by controlling the block length and the total molecular weight

２．論文要旨

Thesis Abstract (In approx. 300 English words)

Poly(lactide) (PLA) is one of the bio-based polymers synthesized from renewable resources and has been expected to be replaced to the conventional fossil resource-based materials. Blending of two isomeric PLAs, poly(*L*-lactide) (PLLA) and poly(*D*-lactide) (PDLA), leads to the stereocomplex (sc) formation. However, both homo crystal (hc) and sc tend to co-exist in the simple blend of PLLA and PDLA. On the other hand, only sc tends to form in the block copolymer of *L*- and *D*-lactic acids (sb-PLA).

In this study, the effects of block length and the total molecular weight of multi-sb-PLA on the thermal property and the crystallization behavior were determined. Multi-sb-PLAs with molecular weights of approximately 60,000 and 130,000 with various block lengths were synthesized from di-block copolymers consisting of *L*- and *D*-blocks with the same length are connected with 1,12-dodecanediol (DMG), an initiator and hexamethylene diisocyanate (HMDI), a chain extender alternately. DSC analyses revealed that T_g increases with the increase in the block length and the multi-sb-PLA with a lower molecular weight has higher T_g at a constant block length. T_m increases with the increase in the block length and the molecular weight of multi-sb-PLA. T_c in the heating process from the amorphous solid decreases and that in the cooling process from the melt increases with the increase in the block length.

The annealed multi-sb-PLA films showed a small and broad endothermic peak at a lower temperature. The WAXD spectra of annealed multi-sb-PLAs only show reflections from the stereocomplex at $2\theta = 12^o$, 20.5^o and 23.5^o. SAXS analysis result shows that lamellar thickness and long period proportionally increases with increasing the annealing temperature.