Poster Presentation

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Crystallization by thermal processing of Poly(lactide) stereocomplex thin films

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Various properties of polymers such as optical, barrier and mechanical properties are substantially anisotropic, since molecular orientations of polymer chains strongly affect the physical properties. Controlling the chain orientation in the semicrystalline polymers can thus lead us to valuable technological breakthroughs. Polymer ultrathin films have attracted great attention due to their vast applications. In thin films, the molecular chain orientation depends on the method of processing, thickness and substrate interactions. In the present study, we report on the crystallization condition dependent molecular chain orientation and crystallinity peculiar to the ultrathin films of biodegradable Poly(lactide) (PLA) stereocomplex (SC) with thicknesses ranging from several nm to several hundred nm. Equimolar solution of two enantiomers of PLA, poly(L-lactide) (PLLA) and poly(D-lactide) (PDLA) has attracted great attention because of the formation of SC which shows decent physical properties better than PLLA and PDLA. Combination of surface sensitive X-ray diffraction and scattering techniques, including grazing incidence wide angle X-ray diffraction (GIWAXD), X-ray reflectivity (XRR) and grazing incidence small angle X-ray scattering (GISAXS) measured at synchrotron radiation facility (SPring-8, Japan) and infrared reflection absorption spectroscopy (IR-RAS) were used to characterize the film structures. In the SC films, two different polymer chain configurations, i.e., lying molecules and standing molecules revealed to be controlled by simple thermal processes.

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