

# Crystallization Behavior of Poly(L-lactic acid) Containing Octamethylenedicarboxylic Dibenzoylhydrazide

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## 1. Introduction:

Poly (L-lactic acid) (PLLA) have been focused owing to its various characteristics. The applications of PLLA are, however, limited because of the low crystallization rate and crystallinity. Generally, crystallization rate is enhanced by nucleating agent. Octamethylenedicarboxylic dibenzoylhydrazide (OMBH) is one of excellent organic nucleating agent for PLLA [1]. In this study, we investigated the effect of OMBH on the crystallization rate and crystalline morphology of PLLA.

## 2. Experiment:

PLLA and nucleating agent (OMBH and talc) are mixed by twin-screwed mixer at 220°C. 220°C is above the melting point of OMBH. OMBH concentration was 0, 0.1, 0.2, 0.3, 0.4, 0.5 wt%. To observe crystallization process, polarizing optical microscope with hot stage was used. To investigate crystallization rate, differential scanning calorimetry (DSC) measurement under isothermal condition was performed. The sample was heated to 220°C, held for 3 min at 220°C, and then cooled to the crystallization temperature.

## 3. Result and discussion:

Fig.1 shows the crystalline morphology diagram in the early stage of crystallization. The crystalline morphology of PLLA/OMBH changes from spherulite to needle-like crystal as increasing the OMBH concentration. Fig.2 shows the result of DSC measurement under isothermal condition. It is clear that the crystallization rate of the needle-like crystal is much faster than that of spherulite. OMBH formed the needle structure in Needle-like crystal region in Fig.1, though no structure derived from OMBH was appeared in Spherulite region. This structure enhances the crystallization of PLLA. At low OMBH concentration, where OMBH does not form any structure, the crystallization rate of PLLA/OMBH is lower than that of talc/OMBH. It is suggested that needle-like crystal region shown in Fig.1 is suitable condition to exert the nucleating ability of OMBH.

## 4. Summary:

The crystalline morphology of PLLA/OMBH changed from spherulite or needle-like crystal depending on the OMBH concentration and temperature. The crystallization rate of needle-like crystal was much faster than that of spherulite.

## 5. Reference:

[1] N. Kawamoto, A. Sakai, T. Horikoshi, T. Urushihara, E. Tobita, *J. Appl. Polym. Sci.*, **103**, 244-250 (2007)

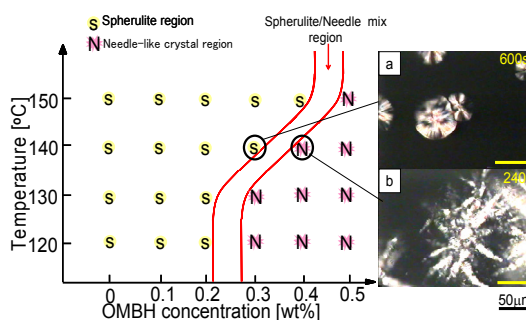


Fig.1 Crystalline morphology diagram in the early stage of crystallization  
(a) 140°C, OMBH 0.3wt%  
(b) 140°C, OMBH 0.4wt%

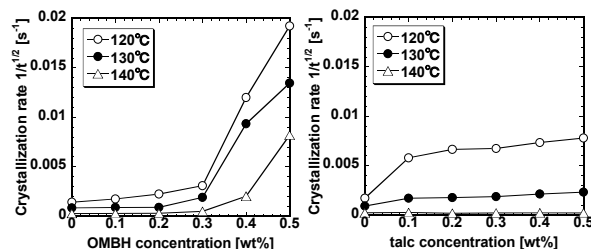


Fig.2 Changes in crystallization rate  $1/t_{1/2}$ , as a function of the concentration of nucleating agent