

Preparation of Inclusion Supramolecular Polymers by Vine-twinning Polymerization Approach

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Abstract

Amylose is a polysaccharide with helical conformation linked through $\alpha(1\rightarrow4)$ -glycosidic linkages. It is a well-known host compound that forms inclusion complexes with hydrophobic guest compounds having relatively lower molecular weight. However, little has been reported regarding the formation of inclusion complexes between amylose and polymeric compounds. In the previous studies, we have developed a new methodology for the preparation of inclusion complexes composed of amylose and synthetic polymers such as poly(L-lactide) (PLLA), which was achieved by the phosphorylase-catalyzed enzymatic polymerization of α -D-Glucose 1-phosphate salt (G-1-P) using a maltooligosaccharide primer in the presence of guest polymers. The representation of this reaction system is similar to the way that vines of plants grow twining around a rod. Accordingly, we have proposed that this polymerization method for the preparation of amylose-polymer inclusion complexes is named “vine-twinning polymerization” [1]-[3]. In this study, we performed vine-twinning polymerization using maltooligosaccharide-functionalized poly(L-lactide), which was a primer-guest conjugate (Figure 1). The XRD, ¹H NMR, and GPC results of product indicated that the elongated amylose chain included PLLA each other to produce the inclusion supramolecular polymer [4].

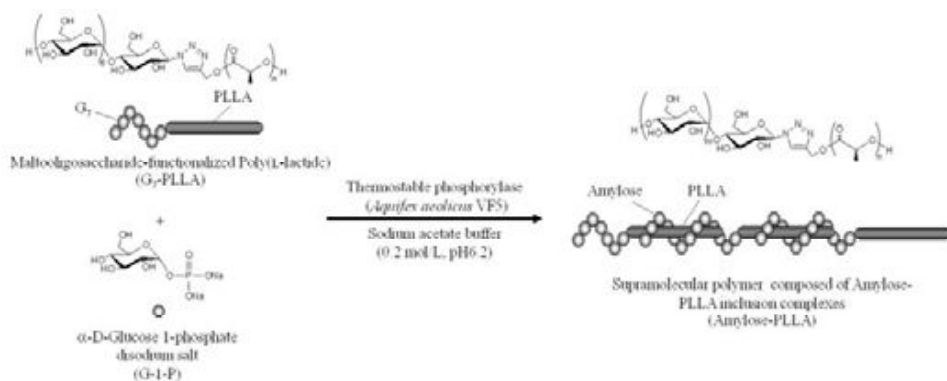


Figure 1 Preparation of supramolecular polymer by vine-twinning polymerization using G₇-PLLA

References

- 1) J. Kadokawa, *Polymers* 2012, 4, 116.
- 2) Kadokawa, *Biomolecules* 2013, 3, 369.
- 3) Y. Kaneko, K. Ueno, T. Yui, K. Nakahara, J. Kadokawa, *Macromol. Biosci.* 2011, 11, 1407.
- 4) T. Tanaka, S. Sasayama, S. Nomura, K. Yamamoto, Y. Kimura, J. Kadokawa, *Macromol. Chem. Phys.* 2013, 214, 2829.