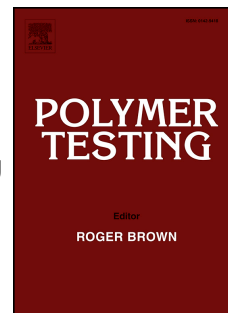


Accepted Manuscript

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PII: S0142-9418(17)30783-3

DOI: [10.1016/j.polymertesting.2017.09.034](https://doi.org/10.1016/j.polymertesting.2017.09.034)

Reference: POTE 5189

To appear in: *Polymer Testing*

Received Date: 12 June 2017

Revised Date: 14 September 2017

Accepted Date: 26 September 2017

Please cite this article as: H. Zhang, S. Wang, S. Zhang, R. Ma, Y. Wang, W. Cao, C. Liu, C. Shen, Crystallization behavior of poly(lactic acid) with a self-assembly aryl amide nucleating agent probed by real-time infrared spectroscopy and X-ray diffraction, *Polymer Testing* (2017), doi: 10.1016/j.polymertesting.2017.09.034.

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Crystallization behavior of poly(lactic acid) with a self-assembly aryl amide nucleating agent probed by real-time infrared spectroscopy and X-ray diffraction

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ABSTRACT

The effect of a self-assembly nucleating agent, *N,N,N'*-tricyclohexyl-1,3,5-benzenetricarboxylamide (BTCA), on the crystallization behavior of poly(lactic acid) (PLA) was probed by time-resolved Fourier transform infrared spectroscopy (FTIR) and wide angle X-ray diffraction (WAXD). The vibrational changes associated with inter- and intra-chain interactions during crystallization were monitored. In the initial period of crystallization, the order of intensity changes is as follows: $1458\text{ cm}^{-1} > 1210\text{ cm}^{-1} \gg 921\text{ cm}^{-1}$, $1458\text{ cm}^{-1} \sim 1210\text{ cm}^{-1} > 921\text{ cm}^{-1}$, and $1458\text{ cm}^{-1} \sim 1210\text{ cm}^{-1} \sim 921\text{ cm}^{-1}$ for neat PLA, PLAs containing 0.1 wt% and 0.3 wt% BTCA, respectively. This indicates that BTCA can accelerate both the formation of skeletal conformational-ordered structure and, especially, the 10_3 helix one. The incorporation of BTCA changes the crystallization mechanism but has no impact on the crystal form of PLA.

Keywords: Poly(lactic acid); Crystallization; Nucleating agent; FTIR; X-ray diffraction

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