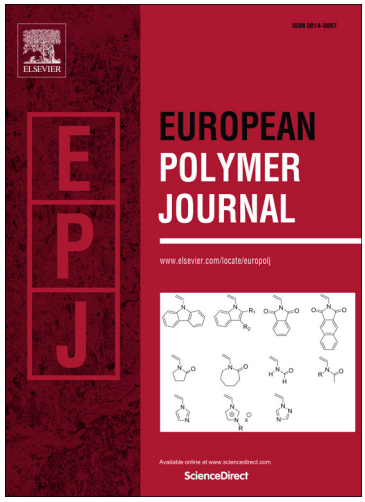

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Memory effect on the crystallization behavior of poly(lactic acid) probed by infrared spectroscopy

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ABSTRACT

The influence of crystalline memory effect on poly(lactic acid) (PLA) crystallization was probed by time-resolved Fourier transform infrared spectroscopy (FTIR). The melt with different degrees of order was prepared by melting at various temperatures. 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 cm^{-1} > 1210 cm^{-1} >> 921 cm^{-1}, 1458 cm^{-1} > 1210 cm^{-1} > 921 cm^{-1}, and 1458 cm^{-1} > 1210 cm^{-1} ~ 921 cm^{-1} for PLA melted at 190, 170, and 168 ^{o}C, respectively. With increasing the degree of order, both the formation of skeletal conformational-ordered structure and, especially, the 10_3 helix structure are accelerated. The influence of memory effect on the crystallization kinetics was also discussed based on the Avrami model.

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