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Metastable Structures of poly(lactic acid) JEFF KALISH, SHAW L. HSU, University of Massachusetts Amherst, KAORU AOU, Dow Chemicals, MEG STARKWEATHER, University of Massachusetts Amherst — The coexistence of two poly(lactic acid) crystals (α' and α) and its impact on the double melting peaks in differential scanning calorimetry is investigated. Solubility differences as well as irreversibility of the α' to α transformation process indicates that the α' crystal is the less stable crystal form. The difference in thermal stability is quantified by measurement of crystal melting enthalpies using the Pyda/Wunderlich method. The relative composition of the crystalline fraction can also be determined by the same method. Crystal annealing is found to be accompanied by an increase in both overall crystallinity and the fraction of the α crystal relative to the α' crystal. Infrared spectroscopy is used to probe the crystal structures. In comparison to the α crystal, the α' crystal is found to have a weakened carbonyl-carbonyl intermolecular interaction. Results also suggest that the α' crystal does not have a 10/3 helix which constitutes the α crystal. The coexistence of the two crystal forms has profound implications in interpretation of double melting peaks in its DSC thermogram.

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