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Structural Disorder and Thermal Properties of the Alpha' Phase of Poly(l-Lacitc Acid) JEFFREY KALISH, SHAW LING HSU, University of Massachusetts - Amherst — Poly(lactic acid) samples rich in alpha' or alpha crystals have been characterized using spectroscopic and thermal methods. Cryogenic infrared and Raman spectroscopy were used to probe the differences in chain conformation and packing. Compared to the alpha crystal, the alpha' crystal has weakened specific carbonyl and methyl interactions. Experimental spectroscopic analysis in conjunction with simulation studies have shown that the alpha' crystal has uniform chain conformational disorder. This disorder in chain conformation and packing leads to different crystalline forms with varying stabilities. The difference in thermal stability was quantified by measuring enthalpic change at melting for both crystalline forms by extrapolation of the glass transition as well as by using small molecule extrapolation. Equilibrium melting enthalpy was determined to be 57 J/g for alpha' and 96 J/g for the alpha crystal. The transformation from the less stable alpha' to the more stable alpha phase has been characterized. This analysis provides an explanation for the double melting peaks usually found in the PLLA samples.

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