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Poly(L-lactic acid) Crystals: From 2D to 3D SUOLONG NI, ROBERT E. MAJOR, ALAN R. ESKER, Department of Chemistry (0212), Virginia Tech, Blacksburg, VA 24061 — The crystallization behavior of poly(L-lactic acid) (PLLA) is studied in Langmuir and Langmuir-Blodgett (LB) films. PLLA Langmuir films exhibit a first-order liquid expanded to condensed (LE/LC) phase transition. Temperature dependent isotherm studies reveal an experimentally accessible critical temperature (Tc) for the LE/LC phase transition. Below Tc, the LE/LC phase transition induces the ordering of PLLA single chain helices, giving rise to two dimensional (2D) smectic liquid crystalline-like lamella in the condensed phase. The nucleation and growth of three dimensional (3D) crystals from 2D helices can be achieved through isobaric experiments. Above Tc, PLLA Lamgmuir monolayers collapse directly from the isotropic LE phase to form 3D single crystals. Annealing studies of the LB-films with 2D lamellar patterns via in-situ atomic force microscopy track the time and temperature dependence growth of 3D crystals. Our system provides a model system for studying crystallization kinetics in ultra-thin films.

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