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Role of lamellar thickness in the kinetics of polymer crystal growth[1] WENBING HU, State Key Laboratory of Coordination Chemistry, School of Chemistry and Chemical Engineering, Nanjing University — The lamellar thickness of polymer crystals reflects their thermodynamic metastability and meanwhile decides the linear crystal growth rates on their lateral sides. The traditional theories about the growth kinetics of polymer crystals, like Lauritzen-Hoffman theory and Sadler-Gilmer theory, attributed the effect of lamellar thickness to the free energy barrier at the lateral growth front, in order to explain the slower growth of thicker crystals observed at higher temperatures. We studied the linear growth rates of flat-on-oriented polymer crystals in ultra-thin films, by means of dynamic Monte Carlo simulations of lattice polymers. We found that at the same temperatures, the thicker crystals are actually growing faster. The effect of lamellar thickness has no relation with the free energy barrier; rather, it is only related with the driving force for crystal growth. On the basis of the intramolecular crystal nucleation model, we discussed a reasonable microscopic image on the growth kinetics of polymer crystals.

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