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ENGINEERING THE CRYSTALLINE MORPHOLOGY OF POLYMER THIN FILMS VIA PHYSICAL VAPOR DEPOSITION HYUNCHEOL JEONG, CRAIG ARNOLD, RODNEY PRIESTLEY, Princeton University — Thin-film growth via physical vapor deposition (PVD) has been successfully exploited for the delicate control of film structure for molecular and atomic systems. The application of such a high-energetic process to polymeric film growth has been challenged by chemical degradation. However, recent development of Matrix Assisted Pulsed Laser Evaporation (MAPLE) technique opened up a way to deposit a variety of macromolecules in a PVD manner. Here, employing MAPLE technique to the growth of semicrystalline polymer thin films, we show the engineering of crystalline film morphology can be achieved via manipulation of substrate temperature. This is accomplished by exploiting temperature effect on crystallization kinetics of polymers. During the slow film growth crystallization can either be permitted or suppressed, and crystal thickness can be tuned via temperature modulation. In addition, we report that the crystallinity of polymer thin films may be significantly altered with deposition temperature in MAPLE processing. We expect that this ability to manipulate crystallization kinetics during polymeric film growth will open the possibility to engineer structure in thin film polymeric-based devices in ways that are difficult by other means.

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