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Engineering the Crystalline Morphology of Polymer Thin Films at a Molecular Level via Matrix Assisted Pulsed Laser Evaporation HYUNCHEOL JEONG, CRAIG ARNOLD, RODNEY PRIESTLEY, Princeton University — Controlling the crystalline morphology of polymeric thin films at a molecular level has been increasingly important due to their potential as the active layer in organic electronics. Typically, the crystalline morphology in films is achieved via thermal annealing or melt-crystallization of spin-cast polymers. This approach often leads to a spherulitic morphology where the crystalline lamellae grow in all directions. Here, we introduce an alternative approach to make crystalline polymer films via Matrix Assisted Pulsed Laser Evaporation (MAPLE). Using polyethylene oxide (PEO) as a model polymer, we show that the preferential orientation of polymer crystals can be controlled during the film growth. By laser-ablating a frozen dilute solution of the desired polymer, MAPLE provides a non-destructive means for the deposition of polymer films. Due to the liquid nature of as-deposited polymers confined in nanodroplets, this technique can exploit the substrate effect on the crystal nucleation and growth of nano-confined polymers during the film growth. Mimicking the epitaxial growth of metallic films, this novel polymer deposition technique may enable the engineering of film properties in a way not achievable in bulk.

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