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Study of crystalline morphologies of polymer films deposited via matrix assisted pulsed laser evaporation HYUNCHEOL JEONG, CRAIG ARNOLD, RODNEY PRIESTLEY, Princeton Univ — Due to the long-chain nature, the crystallization and resulting properties of polymers depend critically on how they are processed. Therefore, studying polymer crystallization under novel kinetic conditions is important from both fundamental and technological viewpoints. We studied the crystalline morphologies of polyethylene (PE) and polyethylene glycol (PEG) formed via Matrix Assisted Pulsed Laser Evaporation, a unique deposition technique for polymeric materials. In MAPLE, the material of interest is kinetically ejected from a frozen dilute solution under high vacuum by an incident pulsed laser beam, and subsequently deposited onto a substrate. Hence, MAPLE provides a means to deposit polymers, with tunable growth rates ranging from $\sim$ 0.01- 10 nm/s onto various substrates held at a preset temperature, without any significant chemical decomposition or molecular weight reduction. We successfully deposited semi-crystalline PE and PEG bulk (>1 μm) and ultrathin (<100 nm) films as well as isolated nano-droplets by taking advantage of the tunable growth rate/deposition time, and subsequently explored the film morphologies formed at various substrate temperatures and growth rates. Morphological features of the MAPLE-deposited polymers, including crystallinity and crystalline plane orientation, were compared to the case of spin-cast and drop-cast films.

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