

Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Polymer Deposition from a Quasi-Vapor Phase as a New Route to Access a Wide Temperature Range for Crystallization HYUNCHEOL JEONG, CRAIG ARNOLD, RODNEY PRIESTLEY, Princeton Univ — Polymer crystallization is strongly governed by kinetics where crystallization temperature (T_c) plays an important role in determining materials properties. Due to the high entropic barrier required for reorganization, the long-chain molecules typically form folded-chain crystals, whose thickness and thermal stability decrease as T_c is lowered. Interesting questions remain regarding crystallization in the deeply supercooled regime. This is partially due to the difficulty in accessing the low T_c range without nucleation. For a strong crystal-former like polyethylene (PE), cooling from a melt or solution always confronts the onset of nucleation at a high T_c followed by rapid crystal growth. Here, we introduce an alternative approach to grow polymer crystals via Matrix Assisted Pulsed Laser Evaporation (MAPLE). This methodology achieves the crystallization of polymers from a quasi-vapor phase at a controlled temperature, allowing for the study of the empirical relationship between T_c and crystal structure over a wide range of T_c . With PE as a model polymer, we investigated the morphological and thermal properties of crystals grown over a wide temperature range down to 120 C below bulk crystallization point.

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Date submitted: 10 Nov 2016

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