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Real-time, Depth-Resolved Structure Development of Flow-Induced "Skin-Core" Morphologies in Polypropylene. LUCIA FERNANDEZ-BALLESTER, DEREK THURMAN, California Institute of Technology, IGORS SICS, LIXIA RONG, Brookhaven National Lab, JULIE KORNFIELD, California Institute of Technology — We present a new method to isolate the signal arising from a given depth at each time point during flow-induced crystallization of isotactic polypropylene using real time rheo-optical and rheo-WAXD measurement based on the linear stress-depth relationship in a pressure-driven flow through a rectangular slit. Using thoughtfully selected sets of shearing conditions (constant ts with varied σw), data analysis of the suite of experiments allows us to examine the incremental contribution to the real-time data from one shear stress to another (with all other conditions fixed) and to attribute the difference to a small spatial region of the sample. This "depth sectioning" technique has enabled us to confirm several existing results and uncovers several new keys to understanding how anisotropic crystalline is induced by flow. Threads first form near the channel wall where stress is highest and grow in length with prolonged flow. After sufficient time, thread length per unit volume saturates. The propagation of threads varies in a nonlinear manner with stress. Prior to saturation, thread propagation is linear with shearing time, providing promising conditions for measuring the thread propagation velocity.

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