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Flow-induced crystallinity in polyethylene as probed by time-resolved Raman spectroscopy and optical microscopy ANTHONY KOTULA, ANGELA HIGHT WALKER, KALMAN MIGLER, National Institute of Standards and Technology — The crystallization of polymer melts under flow is critically relevant to the polymer processing industry. Optical, thermal, and mechanical properties of semi-crystalline polymer products depend on the final crystallinity of the material, which depends on the structure and orientation of the initial molecular-scale crystal nuclei formed in flow. Here, we present a combination of optical microscopy and Raman scattering techniques to analyze structure formation in high density polyethylene during steady shear at low degrees of undercooling. When low shear rates ($\sim 1\ s^{-1}$) are imposed after a temperature quench to less than 10 °C undercooling, fibrous structures aligned parallel to the flow direction appear over a period of minutes. Raman spectra indicate that chain straightening (consecutive *trans* chain conformation) precedes the growth of the crystalline phase, and increased shear increases the rate of growth of the consecutive *trans* and crystalline fractions. Complimentary Raman scattering experiments are performed on n-alkanes to compare conformational similarities in the molecular structure during the crystallization process.

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