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Crystallization of ethylene/alpha-olefin copolymers in shear fields R. SHAMSUNDAR, P. SANE, V. PREMNATH, T.P. MOHANDAS, GURUSWAMY KUMARASWAMY, National Chemical Laboratory, Pune, India — Metallocene ethylene-co-α-olefins represent model materials to investigate the effect of "non-crystallizable defects" on crystallization of sheared copolymers. We present results on polymers having similar molecular weight and polydispersity (viz. same chain mobility), but varying comonomer percentage (viz. varying topological contraints on crystallization). Shear crystallization experiments are performed in a Linkam shear cell using optical techniques to monitor phase change. The polymer is melted at an elevated temperature, then sheared at a controlled rate for a fixed duration. After shearing, the polymer is cooled to a temperature chosen such that the quiescent crystallization time at that temperature is around 5000 s. Therefore, the crystallization temperature varies with comonomer content and serves only as a "read-out" to determine the effect of shearing. Shearing a copolymer (containing just 1 mole percent comonomer) has almost no effect on crystallization kinetics under conditions where shear greatly accelerates homopolymer crystallization. As chain relaxation dynamics are similar for all our polymers, shear enhanced crystallization kinetics in homopolymers is due to the formation of precursors during shear. These precursors are not formed for copolymers. Thus, while precursor formation happens via a rheological pathway, the "crystallizability" of the polymer chain determines the chance of precursor formation.

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