Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Interplay Between a Strong Memory Effect of Crystallization and Liquid-Liquid Phase Separation in Melts of Broadly Distributed Ethylene 1-Alkene Copolymers RUFINA G. ALAMO, AL MAMUN, XUEJIAN CHEN, FAMU-FSU College of Engineering, Department of Chemical and Biomedical Engineering, Tallahassee, FL 32310 — Ethylene-1-alkene copolymers with a broad, bimodal comonomer distribution display acceleration and retardation of the crystallization rate when cooling from a range of melt temperatures where narrow copolymers show a continuous acceleration of the rate. The acceleration of the rate is observed in a range of melt temperatures between 165 and 150 °C, and is due to a strong memory effect of crystallization above their equilibrium melting point. The retardation or inversion of the rate, observed in a range of 150 to 123 °C, demarcates the onset of a self-seed assisted liquid-liquid phase separation (LLPS) between comonomer-rich and comonomer poor molecules. The interplay between number of self-seeds at the initial melt temperature and chain diffusion during LLPS causes a decrease in the crystallization rate with decreasing melt temperature. When crystallites remain in the melt at temperatures <123 °C, the crystallization rate again accelerates quickly. The crystallization rates were studied by DSC, and the effect in nucleation density and in overall crystalline morphology of crystallizations from one phase or two liquid phases was followed by polarized optical microscopy and transmission electron microscopy.

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Date submitted: 12 Nov 2014 Electronic form version 1.4