Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Flow-Induced Crystallization of Poly(ether ether ketone). BEHZAD NAZARI, ALICYN RHOADES, RALPH COLBY, Pennsylvania State University — The effects of an interval of shear above the melting temperature T_m on subsequent isothermal crystallization below T_m is reported for the premier engineering thermoplastic, poly(ether ether ketone) (PEEK). The effect of shear on the crystallization rate of PEEK is investigated by means of rheological techniques and differential scanning calorimetry (DSC) under a protocol of imposing shear in a rotational cone and plate rheometer and monitoring crystallization after quenching. The rate of crystallization at 320 C was not affected by shear for shear rates <7 s^{-1} at 350 C, whereas intervals of adequate shear at higher shear rates prior to the quench to 320 C accelerated crystallization significantly. As the duration of the interval of shear above 7 s^{-1} is increased, the crystallization time decreases but at each shear rate eventually saturates once the applied specific work exceeds ˜120 MPa. The annealing of the flow-induced precursors was also investigated. The nuclei were fairly persistent at temperatures close to 350 C, however very unstable at temperatures above 375 C. This suggests that the nanostructures formed under shear might be akin to crystalline lamellae of greater thickness, compared to quiescently crystallized lamellae.

Behzad Nazari
Pennsylvania State University

Date submitted: 06 Nov 2015 Electronic form version 1.4