Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

New Strategy for Compatibilization of Immiscible Polymer Blends: Block Copolymer Addition during Solid-State Shear Pulverization YING TAO, ANDREW H. LEBOVITZ, JOHN M. TORKELSON, Northwestern University, Evanston, IL 60208-3120 — Hundreds of studies have investigated block copolymer addition during melt mixing as a strategy for compatibilizing immiscible blends. While a few small-scale, academic studies have found that compatibilization may be possible by this route, it has not been commercialized due to thermodynamic and kinetic stumbling blocks, e.g. block copolymers have extremely low critical micelle concentrations in homopolymer leaving few free block copolymers to reach interfaces, and block copolymer diffusion in homopolymers in slow. We have used solid-state shear pulverization (SSSP) to mix a commercially available styrene/ethylene-butylene/styrene block copolymer with a polystyrene (PS)/polyethylene (PE) blend. This approach was demonstrated to be effective by comparing the coarsening rate constant, K, for the pure 90/10wt% PS/PE blend, the PS/PE blend melt mixed with 3.5wt% block copolymer, and the PS/PE blend mixed by SSSP with 3.5 or 5wt% block copolymer. The K values decreased as follows: 0.037 0.022, 0.0039, 0.0012 microns^3/min. When 10wt% block copolymer was mixed via SSSP with an 80/20wt% PS/PE blend, the average dispersed-phase particle size ceased coarsening during annealing when it reached a size of 1.6 microns.

John M. Torkelson
Northwestern University, Evanston, IL 60208-3120

Date submitted: 29 Nov 2004 Electronic form version 1.4