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Effective Mixing of UHMWPE with Polyethylene: Rheological, Mechanical and Crystallization Behavior of Novel Blends Made by Solid-State Shear Pulverization MIRIAN DIOP, JOHN TORKELSON, Northwestern University Evanston, IL 60208-3120 — In comparison with conventional polyolefins, ultrahigh molecular weight polyethylene (UHMWPE) possesses outstanding mechanical properties, including impact strength, making it highly desirable for applications ranging from body armor to implants. Unfortunately, UHMWPE comes with a downside: an ultrahigh melt viscosity that renders common melt processes useless for making products from UHMWPE. Attempts to overcome this problem by blending UHMWPE with polyethylene (PE) by conventional melt mixing have been unsuccessful because of the enormous viscosity mismatch and have led to suspensions of UHMWPE particles within a PE matrix. Here, we show the utility of solid-state shear pulverization (SSSP) to effectively and intimately mix UHMWPE/PE blends. Oscillatory shear rheology of blends containing up to 20 wt% UHMWPE shows both the major impact of the UHMWPE fraction in strongly modifying the low shear rate flow behavior and the very muted effect of that fraction on the high shear rate flow behavior. The latter effect indicates that such blends can be processed by melt extrusion and injection molding. Differential scanning calorimetry supports the presence of co-crystallization in these blends. Mechanical properties of these blends, including impact strength, will also be discussed.

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