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Influence of polyethylene molecular conformation on Taylor impact measurements: a comparison of HDPE, UHMWPE, and PEX CARL P. TRUJILLO, ERIC N. BROWN, GEORGE T. GRAY III, Los Alamos National Laboratory, Materials Science and Technology Division, LOS ALAMOS NATIONAL LABORATORY, MATERIALS SCIENCE AND TECHNOLOGY DI-VISION TEAM — The current work presents the comparison of the Taylor impact response of three different industrial forms of polyethylene. Specifically, high-density polyethylene (HDPE), ultra high molecular weight polyethylene (UHMWPE), and cross-linked polyethylene (PEX) were tested. From quasi-static and intermediate strain-rate compression measurements as a function of temperature (75 to 100C)and strain-rate $(10^{-4} \text{ to } 2600 \text{ s}^{-1})$ the responses of UHMWPE and PEX are very similar, whereas HDPE exhibits some differences. The HDPE samples display a significantly higher yield stress followed by a flat flow behavior. Conversely UHMWPE and PEX both exhibit significant strain hardening after yield. Taylor impact experiments are presented as a function of velocity and temperature to probe the dynamic yield behavior and ductile-to-brittle response of these polymers.

> Eric N. Brown Los Alamos National Laboratory, Materials Science and Technology Division

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