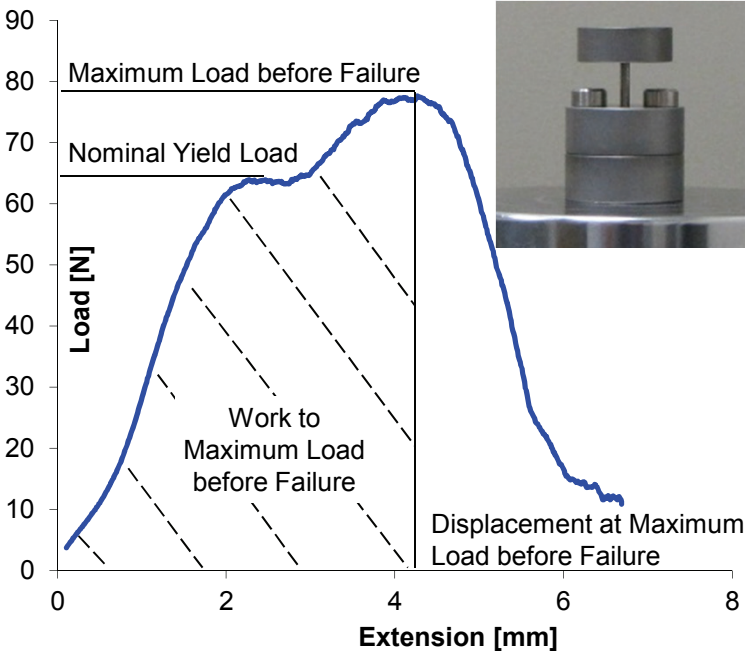


Small punch mechanical analysis of polyethylenes

Summary

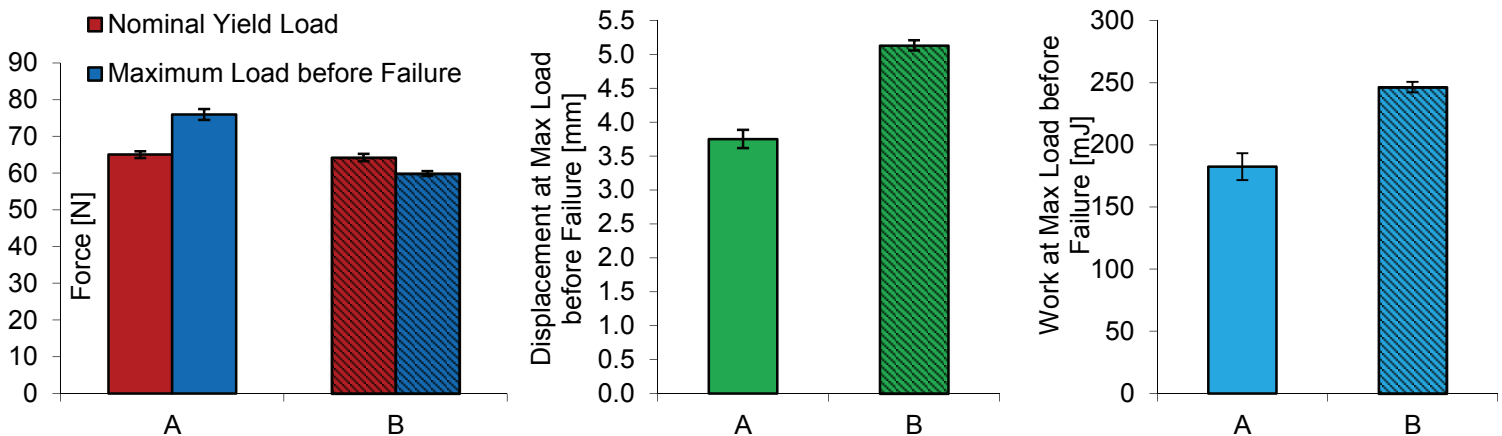
Small punch testing of polyethylenes is an industry standard mechanical test (ASTM F2183) used to assess the mechanical properties of consolidated polyethylene. Inferences about the elastic deformation, plastic deformation, and plastic yield of the material can be determined by analysis of the force-displacement curve. This technique has received increasing interest recently because of the small sample volumes required. However, there is a wealth of extra information available in the data that can be utilized to further aid researchers.



Description

For small punch testing, a tiny disc of UHMWPE is deformed by a hemispherical punch. The deformation creates a biaxial tension in the sample, as the edges are pinned between the die and guide. It is possible to determine stiffness, peak load, ultimate load, ultimate displacement, and work to failure for UHMWPE specimens. However, at CPG, we analyze all facets of the small punch data to determine relationships between first to third generation UHMWPEs that may be aged or unaged, contain antioxidant, and go through different processing conditions. We have also defined new parameters to fully characterize small punch load-displacement curves for highly crosslinked samples that fail by prolonged plastic yield rather than rupture.

Data and outcomes



Uses

- Quality control
- Biomedical materials
- R&D



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