

Title: Characterization of entanglement of UHMWPE

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Reference 8: _____
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Abstract:

UHMWPE (Ultra High Molecular Weight Polyethylene) is a type of PE with very long chains of molecules, which makes it extremely strong.

UHMWPE have several unique characteristics that make them desirable for certain applications. They have high tensile strength, high modulus of elasticity, and are resistant to abrasion and impact. They are often used in applications where strength are critical, such as in bulletproof vests, climbing ropes, and fishing lines.

The high molecular weight of UHMWPE increases the degree of polymer chain entanglement compared to high density polyethylene (HDPE). This high degree of entanglement causes a very high viscosity, which leads to difficulties in processing the final material.

In addition, the presence of entanglements limits the solid-state stretchability of these polymers. Therefore, to produce highly oriented polymers, such as ultra-high performance (UHP) polymer fibers, the removal of entanglements is often a prerequisite.

This objective is typically achieved by solution processing methods, such as gel spinning of UHP polyethylene fibers. However, these solution processing methods are expensive. An advance in solid-state polymer processing can only be achieved if we better understand the relationship between reactor conditions, chain entanglement, growth, and in situ crystallization of chains in the reactor.

Various characterization techniques (DSC, flash DSC, SAXS) are carried out in order to understand the relationship between the degree of entanglement and physical properties such as stretchability and thermal properties of the materials.