

# Processing and Thermal Properties of Molecularly Oriented Polymers

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## **Abstract**

High molecular weight polymers that are linear in molecular construction can be oriented such that some of their physical properties in the oriented direction are enhanced. For over 50 years polymer orientation and processing has been extensively studied to improve the mechanical properties of polymers. In more recent history the anisotropic thermal properties of oriented polymers have been studied. This thesis investigates the thermal properties of Ultra High Molecular Weight Polyethylene (UHMW-PE) and explores applications for the same. This thesis details an effective means of aligning the molecules in bulk polyethylene sheets through stretching in the gel state. Tests have shown that bulk UHMW-PE can be stretched 50-80 times in xylene. The thermal conductivity of bulk UHMW-PE is 0.3 W/mK, while that of a sample stretched 20-25 times is over 4.5 W/mK.

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